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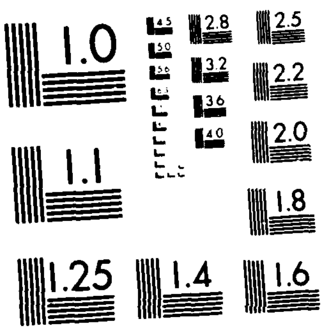

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New Orleans District

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CULTURAL RESOURCES SAMPLE SURVEY OF THE BAYOU COCODRIE AND TRIBUTARIES PROJECT, ST. LANDRY, EVANGELINE AND AVOYELLES PARISHES, LOUISIANA.

FINAL REPORT

February 6, 1987

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1306 Burdette Street
New Orleans, Louisiana 70118

Prepared for

U.S. Army Corps of Engineers
New Orleans District
P.O. Box 60267
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Avoyelles Parish	Bayou Courtableau	Dry Bayou
Backswamp	Bayou Little Teche	Evangeline Parish
Bayou Boeuf	Bayou Teche	Historic Archeology

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report presents the results of a probabilistic survey of five per cent of the wooded areas within the ~~three-year~~ flowline of the Bayou Cocodrie and Tributaries Project area. The survey is based on a stratification of the project area by drainage reach and geomorphological features. Seven sites were discovered during this survey. (continued)

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Key Words (Continued)

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Maintenance Sites
Man-Land Relationships
Marksville
Middle Woodland

Point Bar
Prehistoric Archeology
Quadrat
Quaternary Prairie Terrace
Resource Extraction Sites

Sample Fraction
Sample Unit
Sampling Design
St. Landry Parish
Stratified Random Sample

Transect
Troyville-Coles Creek

(Abstract continued)

These sites have been employed to characterize the archeological resource base within the project area. ~~An~~ analysis of present and future land use, based upon ~~the~~ past and predicted clearance of forested land within the project area, permits assessments of the nature and extent of impacts to the archeological resource base from project induced land clearance. Site distributions among the geomorphological strata have been predicted based on a general model of prehistoric use utilization of the alluvial floodplain. The predicted and observed distributions permit discussions of man-land relationships within the project area. Previously recorded site locations ~~have~~ been employed to permit further assessments of these predicted relationships. Recommendations concerning the sites discovered and further research in the project area are made.

DEPARTMENT OF THE ARMY
NEW ORLEANS DISTRICT, CORPS OF ENGINEERS
P.O. BOX 60267
NEW ORLEANS, LOUISIANA 70160-0267

REPLY TO
ATTENTION OF

February 12, 1987

Planning Division
Environmental Analysis Branch

To The Reader:

This cultural resources effort was designed, funded and guided by the U.S. Army Corps of Engineers, New Orleans District as part of our cultural resources management program. The report documents a stratified random sample survey of portions of the Bayou Cocodrie and Tributaries project area. The objectives of the study were to characterize the cultural resources of the affected areas, estimate the potential impacts of project-induced agricultural intensification on cultural resources, and assess the significance of the project-induced impacts on the resource base.

We concur with the Contractor's conclusion that the impacts of project-induced land clearing on the cultural resource base of the study area are not significant. Thus, no further study of these project impacts is planned. We also concur with the Contractor's conclusion that the implementation of subsequent drainage improvements in the study area would have the potential for significant adverse impacts to cultural resources. At present, no such drainage plans are imminent in the project area. Recommendations for cultural resource studies to prevent or mitigate such impacts are, therefore, deferred to the agency which may undertake such improvements in the future.

New Orleans District archeologists played a significant role in the design of the sampling methodology and the analyses and conclusions drawn from the data. We believe that the study methodology has broad applicability for similar research in the lower Mississippi River alluvial valley.

Michael E. Stout
Michael E. Stout
Technical Representative

Howard R. Bush
Howard R. Bush
Authorized Representative of the Contracting Officer

Cletis R. Wagahoff
Chief, Planning Division

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PREFACE

This study could not have been completed without the assistance of a number of people. We would like to take this opportunity to thank those who provided assistance during the course of the design, implementation, and analysis phases of the project. Mr. Michael E. Stout, of the Planning Division, New Orleans District, U.S. Army Corps of Engineers, designed and wrote the Scope of Services for this effort, and provided valuable information concerning the Bayou Cocodrie and Tributaries Project and project area. The development of a stratification of the study area which was expected to reflect past human activities would not have been possible without this contribution to the research effort. Additionally, Messrs. Stout and James E. Chase, also of the New Orleans District, U.S. Army Corps of Engineers, provided guidance in the development of the sampling design. During fieldwork, a number of residents of St. Landry Parish provided logistical support which accelerated the completion of this portion of the study. Mr. Ed Thistlethwaite, of Washington, Louisiana, provided flyovers of the project area prior to the development of the research design. In addition, Mr. Thistlethwaite expended great efforts in providing liaison with residents and landowners in the region. Mr. Mike Soileau, of Washington, Louisiana, provided the survey boat and his time to assist in the use of this boat. Mr. J.J. Bertrand of Opelousas, Louisiana, and Mr. Homer Mire of Bunkie, Louisiana, provided information concerning a number of the sites discovered during the survey.

Those who assisted in the completion of the fieldwork included Billie Barton, Don Bascle, Tim Crawford, Susan Hammersten, and Carol Poplin. Their efforts under unsavory conditions permitted the completion of the fieldwork with a minimum of problems. Mr. Joseph V. Frank of Lake Charles, Louisiana, graciously analyzed the prehistoric ceramic artifacts from the Noel Slough site (16SL89) and the Milburn site (16SL94) and the projectile points from the Bertrand site (16SL91). This project could not have been completed without these efforts.

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CHAPTER I

A DESCRIPTION OF THE BAYOU COCODRIE AND TRIBUTARIES PROJECT AND SURVEY

Introduction

This report, undertaken pursuant to Delivery Order No. 0004 of Contract No. DACW29-85-D-0113, presents the results of a cultural resources sample survey and land use analysis within the Bayou Cocodrie and Tributaries Project area. This survey is probabilistic, in order to provide information that may be used to predict the kinds, quantities, and distribution of archeological resources within the larger project area. This survey effort enables the characterization of the potential impact to such resources as a result of the increased agricultural activity expected to result from the completion of the project.

The Bayou Cocodrie and Tributaries Project

The Bayou Cocodrie and Tributaries Project is designed to reduce floods within the watersheds of Bayous Rapides, Boeuf, and Cocodrie per Section 3 of the Flood Control Act of August 18, 1941 (House Document No. 359, 77th Congress). This reduction is to be accomplished through the improvement and realignment of existing channels, the construction of diversion canals, and the installation of control devices. Project construction has continued since 1946 and is fifty-three per cent complete at present.

Modifications to this project under Section 87 of the Water Resources Development Act of 1974 provided for the enlargement of Bayou Courtableau from Washington, Louisiana, to the West Atchafalaya Basin Protection Levee and the construction of additional culverts through the levee as necessary. This modification will result in a significant increase in the hydraulic capacity of Bayou Courtableau. The increased hydraulic capacity of Bayou Courtableau is expected to reduce the amount of flooding which occurs within the three-year flowline of the project area. Combined with local modifications (e.g., "SCS type" drainage improvements), the reduction of flooding is expected to result in increased agricultural activity within the three-year flowline in Reaches K, L, and M of the project (Figure 1).

The expected agricultural activities provide two sources of possible impact to archeological resources within the project area. The first source is the clearance of presently wooded areas

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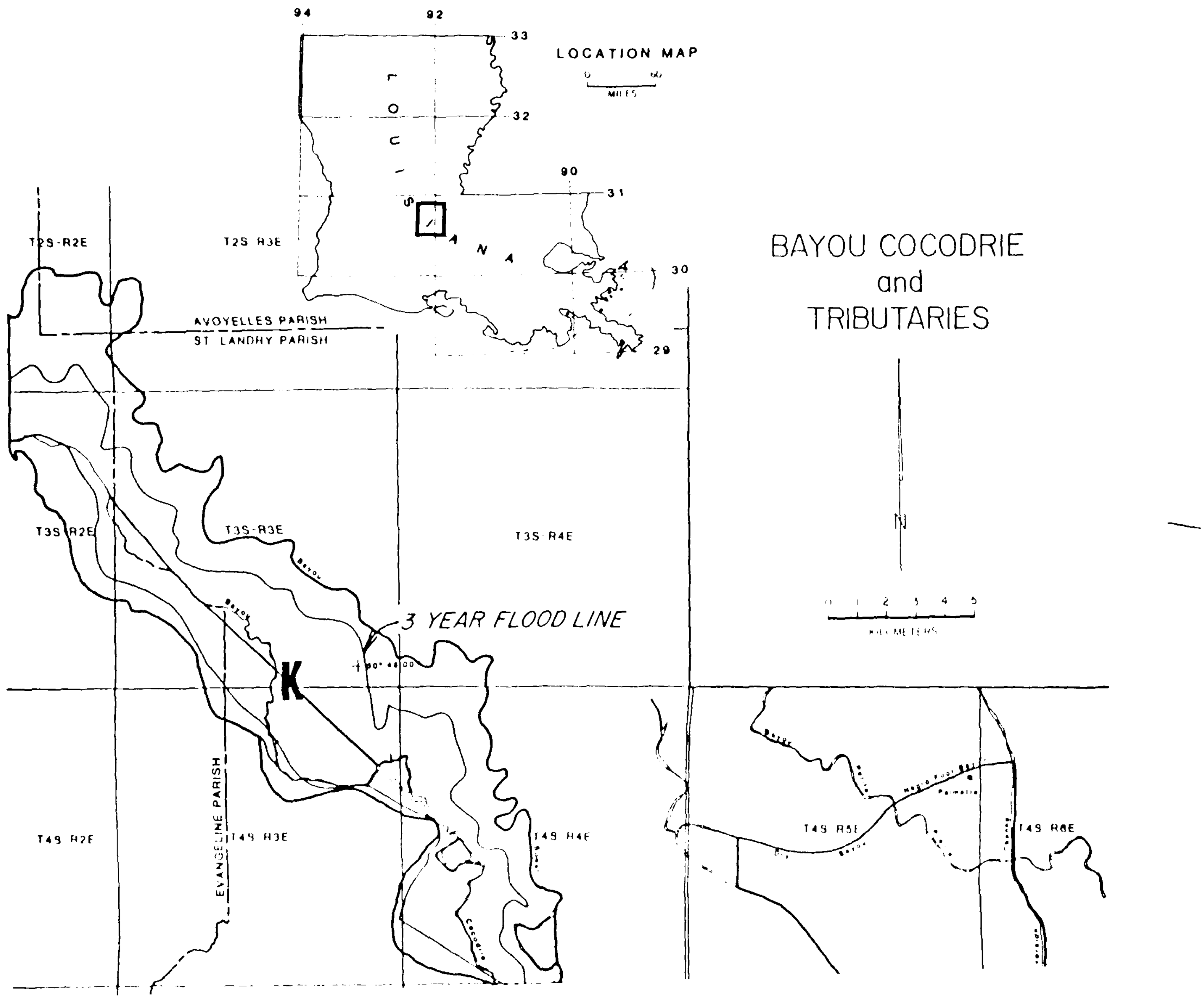
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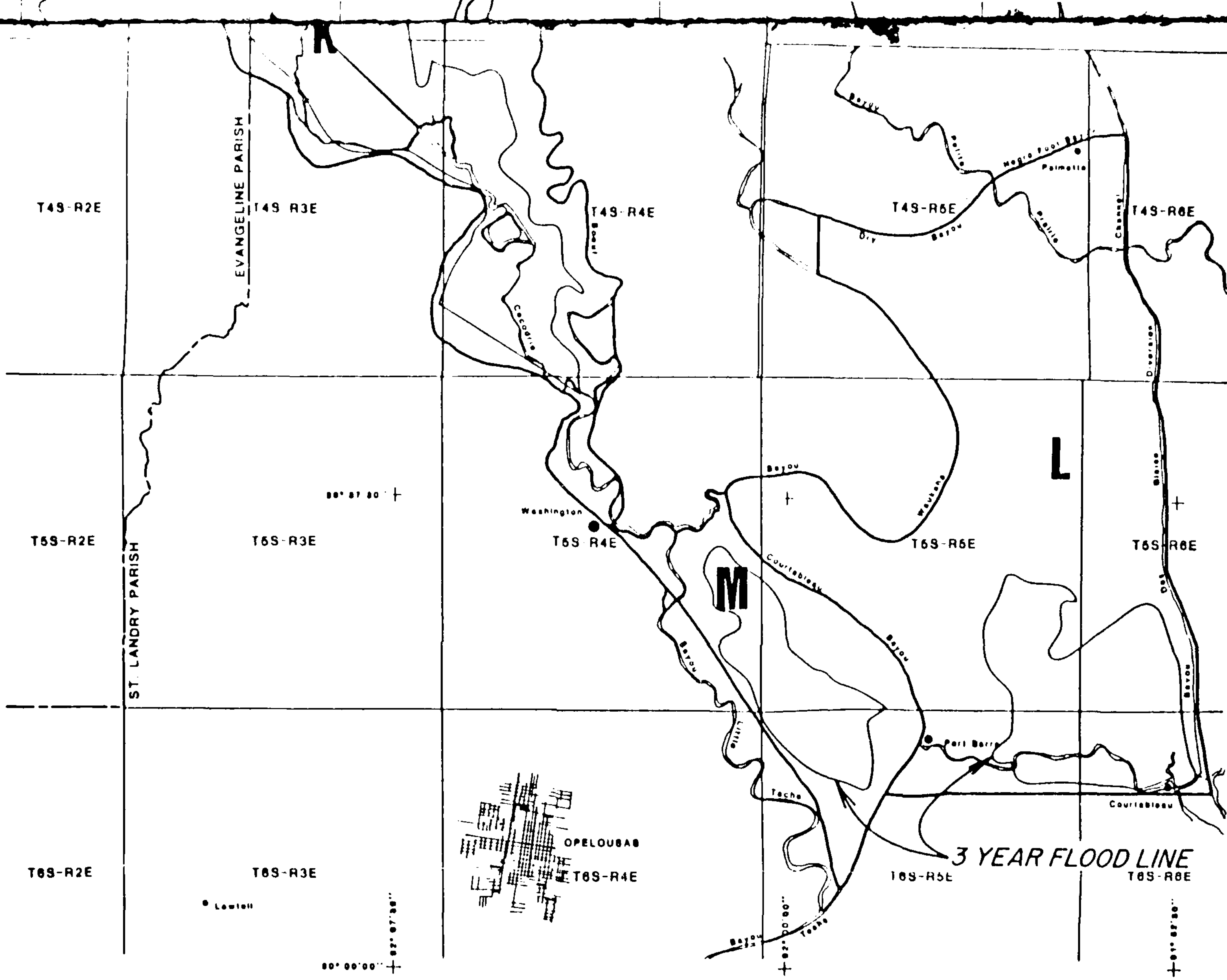

Figure 1. Bayou Cocodrie and Tributaries Project area showing the boundaries and three-year without project flowlines within each reach.

to create more cropland within the reaches. This clearance is expected to be a direct result of the decreased intensity and frequency of flooding which will result from the completion of the project. Approximately five per cent of the existing woodlands within the present three-year flowline are expected to be affected by this project-induced clearing.

The second source of possible impact involves the introduction of "SCS type" drainage improvements. While no such plans are imminent in the project area, an increase in the hydraulic capacity of Bayou Courtableau would permit the realization of maximum agricultural intensification through such a plan. Thus, the completion of the Bayou Cocodrie and Tributaries Project would result indirectly in possible impacts from the construction of major and on-farm drainage laterals and the further land clearance such activities would permit.

The Archeological Survey Project

The archeological survey examines a stratified random sample of five per cent of the total wooded area within the three-year without-project flowline. Portions of this total wooded area are expected to be cleared to permit agricultural exploitation of these areas. The analysis of the location and nature of the sites located during this survey, combined with site information drawn from previous studies, will permit the characterization of the universe of archeological resources which exist within the project area.

An analysis of present land use permits discussions of the potential impact to these resources. Data for this analysis is drawn from previous studies conducted both within the project area and in neighboring areas. The potential impacts as they affect the archeological resource base as a whole and at a site-specific level is then analyzed. This latter assessment (i.e., site-specific) is based on the examination of archeological sites discovered during the survey.

Initially, the project area can be stratified by reach due to the physiographic differences between the reaches (Figure 1). Each reach has different relationships with the surrounding waterways and major topographical features. These different relationships may have influenced past human utilization of these areas. In addition, modern land use differs somewhat within each reach (e.g., percentage of wooded area, percentage of agricultural land, presence of oil and gas wells, etc.). These differences in land use between reaches will assist in the assessments of project-induced impacts on the archeological resource base.

Inside each reach, additional strata can be defined on the basis of discrete geomorphological features present within the project area. These strata provide a basis for discussions of man-land relationships which represent an initial step toward defining the patterning of aboriginal human utilization of the project area. Both diachronic and synchronic evaluations of this utilization will be possible given the relationships between the geomorphological strata and the known episodes of past alluvial deposition.

Underlying this sampling design are certain assumptions concerning the relationships between human groups and their environments. These are:

1. Human activities are not spaced across a landscape at random.

2. The location of activities are selected to take advantage of some aspect of the locale.

3. Within the project area, natural features provide surfaces with varying attributes upon which human activities can occur.

4. The attributes of these surfaces will affect the kinds and densities of the activities which can occur on them.

5. Archeological resources, the residues of human activities, will reflect these differences in the deposits on or in which they rest.

If these assumptions are correct, then the location of human activities and their residues can be predicted from the nature of the surficial feature where they occur.

This hypothesized relationship provides a basis for the stratification of the project area by geomorphological features. The identification of some of the attributes which differentiate the strata will permit predictive statements concerning the nature and densities of prehistoric sites in the project area. These statements will represent a preliminary model of human utilization of the project area. The results of this survey provide both a characterization of the archeological resources within the project area and an assessment of the validity of this hypothesis.

Format of this Report

The nature of the reaches and the geomorphological strata will be presented in Chapter II. The hypothesized implications of the differences between the strata for prehistoric activities will be presented in Chapter III. The historic background of the project area and the ability of the survey to address historic research will be presented in Chapter IV. Chapter V provides a summary of the sampling strategy and field methodology employed to operationalize the survey. Chapter VI presents a description of the results of the survey. Analyses of the data obtained from the survey is discussed in Chapter VII. Chapter VIII presents the assessment of current and projected land use on the archeological resource base defined through the survey. The final chapter provides a summary of the results and analyses discussed in the preceding chapters and presents recommendations concerning this data base.

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CHAPTER II

LANDFORMS AND SOILS OF THE BAYOU COCODRIE AND TRIBUTARIES PROJECT AREA

The Bayou Cocodrie and Tributaries Project area lies in the lower Mississippi River Valley between the eastern slope of the late Quaternary Prairie Terrace and the western levee of the Atchafalaya Floodway. The geologic history of the region is dominated by episodes of fluvial deposition directly related to the cyclic glaciations of North America during the Pleistocene epoch. While the lower Mississippi Valley area was not contacted by the continental ice sheets, these glaciers were responsible for the derangement of the previous mid-continental drainages and the formation of the southward-flowing river system of the present Mississippi River through their discharge of large volumes of glacial meltwater and outwash (Saucier 1974:2). This river system has been responsible for the formation of geomorphological features within the study area. It has influenced the formation of soils and the development of the faunal and floral communities which occupy the project area at present.

The Project Area

The project area includes portions of Bayous Boeuf, Cocodrie, and Rapides in Avoyelles, St. Landry, and Evangeline Parishes. This particular survey is limited to the wooded areas within the three-year flowline in Reaches K, L, and M. As of 1984, these woodlots occupied 11,400 acres (4614 hectares), primarily in St. Landry Parish.

While the project involves all three reaches, each reach represents a distinct physiographic drainage area within the western portion of the greater Mississippi River alluvial plain. They have different relationships to a number of past depositional events and modern physiographic features. These differences permit the consideration of each as a distinct unit. A discussion of these differences with respect to past events will be presented below.

Reach K encompasses 37,500 acres (15,180 hectares) along Bayous Cocodrie, Boeuf, and Courtableau, extending from Gaging Station K/37.8 in the north to the town of Washington in the south (approximately 18 linear miles). This area lies on the west banks of Bayous Cocodrie and Courtableau, between Bayous Cocodrie and Boeuf, and on the east bank of Bayou Courtableau. The reach contains 17,400 acres (7042 hectares) within the three-year flowline. Of this area, 9300 acres (3764 hectares) are wooded.

These figures are summarized in Table 1 from information contained in Gulf South Research Development Corporation (1984). Figure 1 displays the boundaries of Reach K and the three-year flowline within the reach.

This reach represents the extreme margin of the greater Mississippi alluvial plain. Its western edge is dissected by small drainages from the Quaternary Prairie Terrace to the west. Bayous Boeuf and Cocodrie drain large portions of southeastern Evangeline and southwestern Avoyelles Parishes to the north of the present project area. Bayou Courtableau forms at the confluence of these bayous and originally carried this accumulated flow on to the south and east toward the Atchafalaya River.

Reach L contains 35,100 acres (14,205 hectares) between Dry Bayou in the north, Bayous Wauksha and Courtableau in the west, Bayou Courtableau in the south, and the Des Glaises Diversion Canal in the east, plus a strip of land between Bayou Courtableau and US Highway 190. The area immediately north and east of Port Barre is excluded. Reach L has 5700 acres (2307 hectares) within the three-year flowline; 1,516 of these (614 hectares) are wooded (see Table 1). Figure 1 displays the boundaries of Reach L and the area within the three-year flowline.

Dry Bayou drains portions of northern St. Landry Parish flowing southeast and then turning to the northeast, originally emptying into Bayou Petite Prairie and the Atchafalaya River. Presently, this flow is interrupted by the Des Glaises Diversion Canal. Bayou Wauksha drains the area of southwestern Avoyelles and northwestern St. Landry Parishes to the east of Bayous Boeuf and Cocodrie. It flows south and east into Bayou Courtableau and thence historically, into the Atchafalaya River. The upper portion of Bayou Courtableau flows southeast along the western boundary of the reach to Port Barre, Louisiana. Originally, this bayou flowed on to the east beyond the reach and to the Atchafalaya River. Presently, the flow is occasionally to the west between the Des Glaises Diversion Canal and the confluence of Bayou Teche at Port Barre. This entire reach lies within the greater alluvial floodplain of the Mississippi River.

Reach M occupies 14,400 acres (5828 hectares) along the Bayou Toulouse between its junctions with the Bayou Courtableau in the north and Bayou Teche in the south. Eastern and western boundaries are defined by Bayous Courtableau and Little Teche, respectively. Approximately 3700 acres (1497 hectares) of this reach lie within the three-year flowline. Woodlots occupy 1500 acres (607 hectares) of this total (see Table 1). Figure 1 displays the boundaries of Reach M and those portions within the three-year flowline.

Table 1. Area by Reach in the Bayou Cocodrie and Tributaries Project (after GSRDC 1984).

	Total				Within 3-Year Flowline			
	Total	Cleared	Wooded	Water	Total	Cleared	Wooded	Water
Acres								
Reach K	37,500	24,150*	12,750*	600	17,400	7,650	9,300	450
Reach L	35,100	25,900	8,500	700	5,700	3,683+	1,517+	500
Reach M	14,400	11,500	2,200	700	3,700	1,900	1,500	300
Total							**11,400**	
Hectares								
Reach K	15,180	9,774	5,160	243	7,044	3,096	3,764	182
Reach L	14,205	10,482	3,440	283	2,307	1,491+	614+	202
Reach M	5,828	4,654	890	283	1,497	769	607	121
Total							**4,614**	
Per Cent								
Reach K		64.5	34	1.5		44	53.5	2.5
Reach L		74	24	2		65	26.5	7.5
Reach M		80	15	3		51.5	40.5	8

*Estimated from figures for 3-year and 100-year flowlines.
+Area estimated by planimeter.

Like Reach K, Reach M lies adjacent to the older uplands to the west. Bayou Carron flows north along the western margin of the reach, collecting some of the smaller drainages which dissect the terrace edge and emptying into Bayou Courtableau to the east of Washington, Louisiana. From approximately the midpoint of this bayou, it also flows to the south as Bayou Little Teche. This southern flow empties into Bayou Teche just outside the reach boundary and is carried by Bayou Teche to the south into the Vermilion River. Along the northern and eastern margins of the reach, Bayou Courtableau flows south and east to its confluence with Bayou Teche. As with the flow from Bayou Little Teche, this discharge is carried to the south at present.

Current land use is different between the three reaches. This is reflected in the relative amounts of cleared, wooded, or water-covered land within each reach (see Table 1). While all reaches contain roughly equivalent amounts of each class of land, the relative areas within the three-year flowline display greater differences. As this project is delimited by this flowline, the differences within these smaller areas will be discussed.

Reach L contains the greatest relative amount of cleared land (65 per cent). It is assumed that such areas are employed as agricultural fields (including pastures, fallow land, and crawfish ponds). The greatest intensity of agricultural activity is considered to be occurring in this reach. Based on unsystematic observations during the fieldwork, the majority of this activity is in the commercial cultivation of soybeans. Reaches K and M contain equivalent amounts of cleared land (44 per cent and 51.5 per cent respectively). The agricultural activities in these reaches appears more diverse based on field observations. Products (listed in order of their frequency of occurrence) in Reach M include soybeans and corn, with limited amounts of pasturage. Reach L contains corn, soybeans, rice, pasturage, milo, and crawfish ponds.

The relative amounts of wooded area within each reach are in reverse order to their relative amounts of cleared land. The greatest relative amount of wooded area is in Reach K (53.5 per cent). Reach M contains a roughly equivalent amount (40.5 per cent). Reach L has the least amount (26.5 per cent). With the exception of Reach K, these woodlots are scattered throughout the area under consideration. This results in a patchy distribution of woodlots over Reaches L and M within the three-year flowline.

The utilization of these woodlands at present appears to be recreational for the most part (i.e., hunting, fishing, "tramping about"). This is especially true in Reaches L and M, where the wooded areas are in small lots and widely scattered amidst the agricultural lands. Some of these areas may be employed as pasturage, as evidenced by fences and extensive grassy understory in some of the surveyed areas in Reach M. No animals or evidence of their presence was observed in these areas during the survey, however. In Reach K, some of the wooded areas are owned by timber companies. In many instances, it is in the interest of these firms to retain areas in woodland rather than harvesting the timber (see MacDonald et al. 1979). This retention of wooded areas will be discussed further in Chapter VIII.

An aerial reconnaissance revealed that some of these scattered wooded areas, which are surrounded by agricultural fields or pastures, contained standing water as of May 1, 1986. Field observations within many of the wooded areas surrounded by agricultural land confirmed the regular presence of standing water within these woodlots. This poor drainage must be a factor in the retention of these areas as woodland at present. The implications of this poor drainage with respect to current and future land use will be discussed in Chapter VIII.

The relative amounts of wooded and cleared land imply other factors which contribute to the difference in land use between the reaches. Examinations of topographic maps of the project area reveal that there are more residences along Bayou Courtableau than any of the other bayous in all reaches. Coupled with the closer proximity of Washington, Opelousas, and Port Barre, Louisiana, to Reaches L and M, it appears that these reaches have higher population densities than Reach K. The higher relative amounts of cleared land within Reaches L and M support this observation.

Reach M contains a large portion of the Opelousas Oil and Gas Field. This region of petroleum exploration and production has provided the opportunity for numerous activities which are not likely in the other two reaches with the exception of a small portion of Reach L bordering US Highway 190 near the confluence of Bayou Courtableau and Darbonne Bayou. These include the construction of access roads (either gravel or wooden), the drilling of wells, and the construction of networks of underground pipelines and above ground pumping facilities. While most of the construction activities are finished, these activities have permitted access to portions of the reach which were more difficult to reach prior to the construction of the oil and gas field.

Geomorphology of the Project Area

The late Quaternary Prairie Terrace that forms the western boundary of the relict Holocene-Mississippi River alluvial valley is directly adjacent to the project area, where the lower surface of the Prairie Terrace flanks the western boundaries of Reaches K and M. Saucier (1974:6) describes the Prairie Terrace as "partly a relict deltaic plain of the Red River and partly a relict upper deltaic plain or lower alluvial plain of the Mississippi River." This terrace is thought to have developed during a period of valley aggradation associated with the Sangamonian Interglacial Stage between 80,000 and 100,000 years B.P. (Saucier 1974:16). He notes that the late Quaternary Prairie Terrace "ranks second to the Holocene in terms of the degree of preservation of relict geomorphic features on its surface" (Saucier 1974:6). This terrace contains a number of abandoned courses and channels which formed during the late Pleistocene or early Holocene. According to Saucier (1974:7), at least one of these channels between Lafayette and Marksville, Louisiana, is large enough to indicate the Mississippi River as its source of origin. Gagliano et al. (1978:18) have identified a number of relict alluvial features associated with a former major course of the Mississippi River on the Prairie Terrace near Washington and Opelousas, Louisiana, as well.

The project area lies within the relict Holocene-Mississippi River alluvial valley which formed at the end of the last Wisconsinan glacial retreat. This valley contains relict alluvial deposits which represent a number of different meander belts of the Mississippi and Red Rivers. Using maps prepared by the U.S. Army Corps of Engineers (USACE 1982) which display the alluvial deposits in the project area, four different kinds of deposits have been identified. These are: abandoned channels, abandoned courses, point bars and backswamp. These deposits represent gross geomorphological features in the project area. Figure 2 displays the distribution of these four types of features within the project area.

Geomorphological features containing these different deposits have varying attributes related to the fluvial processes responsible for their deposition. During most of the Holocene, floodplain and backswamp areas were marginal to meander belts (i.e., abandoned courses and channels or point bars), with the marginal areas receiving alluvial clays and silts. Saucier (1974:11) notes that the distribution of backswamp areas and deposits in the lower Mississippi Valley reflects dramatically the downstream changes in the hydrologic regimen and sediment load of the Mississippi River, the frequency and distribution of meander belt development, and the effects of eustatic sea level variation on river gradient.

As stated above, areas identified as backswamp contain alluvial clays and silts carried to their present location by overbank flooding. These deposits are spread laterally away from the meander belts of the rivers which are responsible for their deposition. These deposits can be quite deep. Along the Mississippi River and its former meander belts, these deposits approach 100 feet in thickness north of Baton Rouge, Louisiana (Saucier 1974:11). Backswamps associated with the Red River and its former meander belts can be expected to be siltier, thinner (less than 40 feet in thickness), and more discontinuous than those associated with the Mississippi River (Saucier 1974:12). Topographically, these areas are quite flat but may contain depressions which are seasonally or permanently flooded.

Abandoned channels represent oxbow cut-offs from the main watercourse in a meander belt. These features will be present in various stages of filling during the active depositional period of the belt. When completely filled, these features contain clays and silts with thicknesses of 100 feet or more for Mississippi associations and 70 to 80 feet for Red River deposits. These areas are often lower than other meander belt deposits and typically support dense swamp and forest vegetation. This is in contrast to the predominance of cleared agricultural land on other meander belt deposits (Saucier 1974:10).

Abandoned courses represent the last extant channel within a meander belt prior to the diversion of the stream to a new area. Such features can be expected to contain silty or sandy clays over silty sands or sands and, at some depth, sands and gravels. These features are often reoccupied by smaller streams. These streams may conform to the older meander belt system or form their own smaller one within the confines of the older course. Such occurrences are visible from geological maps of the study area (USACE 1982) for Bayous Boeuf, Cocodrie, Courtableau, and Wauksha. Topographically, these features often display the greatest relief of meander belts, especially where natural levee crests join the abandoned courses or active streams (Saucier 1974:10-11).

Point bar deposits represent the relatively coarse-grained materials (i.e., sandy clays, silty sands, or sands) that result from channel migration within the meander belt. These deposits are distributed laterally away from the watercourse much like backswamp deposits. They are, however, adjacent to the watercourse and deposited without regard to overbank flooding. These deposits may produce an undulating topography with ten to fifteen feet of local relief (Saucier 1974:10).

All of the above deposits may be covered by a thin veneer of natural levee materials. These levees form as low ridges along all active channels and courses. Natural levee deposits are usually silty and sandy clays which are well-drained. These features present a gently undulating surface which slopes away from the watercourse at a very low gradient. While levees related to different sized streams may be distinguished one from another, these deposits often display irregular or gradational boundaries (Saucier 1974:10). This ambiguity presents difficulties in mapping these deposits and in using them as a basis for further stratification of the study area.

Having defined four geomorphic strata within the project area, one may attempt to associate the particular meander belt features they represent to past depositional episodes. Backswamp deposits are assumed to be associated with the nearest meander belt deposits unless field inspections indicated otherwise.

As Table 2 illustrates, five different episodes of deposition are represented in the project area. The earliest deposits represent an abandoned channel associated with the Bayou Tortue-Mississippi River phase [Saucier's (1974:17) Meander Belt 1, 8,500-6,000 B.P.]. The Teche-Mississippi channel [Saucier's (1974:17) Meander 3, 6,000-4,600 B.P.] represents another of the Mississippi's relict Holocene courses located within the project area. Teche-Mississippi deposits are present in the form of abandoned courses, abandoned channels, and associated point bars. Three episodes of deposition by the Red River are present in the form of abandoned courses and point bar deposits. These include the Wauksha-Red, the Petite Prairie-Red and Boeuf-Red episodes. The Wauksha-Red course formed a tributary of the Teche-Mississippi, and its former channel lies roughly parallel to the upper course of Bayou Courtableau and the Bayou Carron-Bayou Little Teche channel. The Wauksha-Red course (Meander Belt 1) represents channels active between 5,400 to 3,900 B.P., while the Petite Prairie-Red course (Meander Belt 2) was active between 4,000 and 2,200 B.P. (Saucier 1974:17). The Boeuf-Red course [Saucier's (1974:17) Meander Belt 4, 1,500-500 B.P.] formed later than the Wauksha-Red, as a result of a partial reoccupation of the Wauksha-Red meander belt by the Red River, with the concomitant obscuring of the Wauksha-Red deposits by sediment from the Boeuf-Red episode (Gagliano et al. 1978:24-25). A description of these distributions by reach follows (see also Figure 2).

Reach K contains deposits related to the Bayou Tortue-Mississippi depositional episode and to a minimum of two episodes of Red River deposition. Bayou Cocodrie occupies the abandoned Wauksha-Red course and Bayou Boeuf occupies an abandoned Boeuf-Red River course (Gagliano et al. 1978:22). None of the later Red River deposits, however, lie within the three-year flowline. A section of abandoned channel deposits north of the town of Washington, Louisiana, appears to be related to the Bayou Tortue-Mississippi depositional episode (Gagliano et al. 1978:23). This section of abandoned channel and its associated point bar deposits represents the oldest relict feature within the three-year flowlines present in Reach K.

Reach L primarily contains deposits related to the Teche-Mississippi episode. These deposits are represented by abandoned

Table 2. Major Meander Belts Located Within The 3-Year Flowline (after Gagliano 1978).

Meander Belt or Course	Associated Reach
Bayou Tortue-Miss. (8,500-6,000 B.P.)	K
Early Teche-Miss. Late Teche-Miss. (6,000-4,600 B.P.)	L,M
Wauksha-Red (5,400-3,900 B.P.)	K,L,M
Petite Prairie-Red (4,000-2,200 B.P.)	L
Boeuf-Red (1,500-500 B.P.)	K,M

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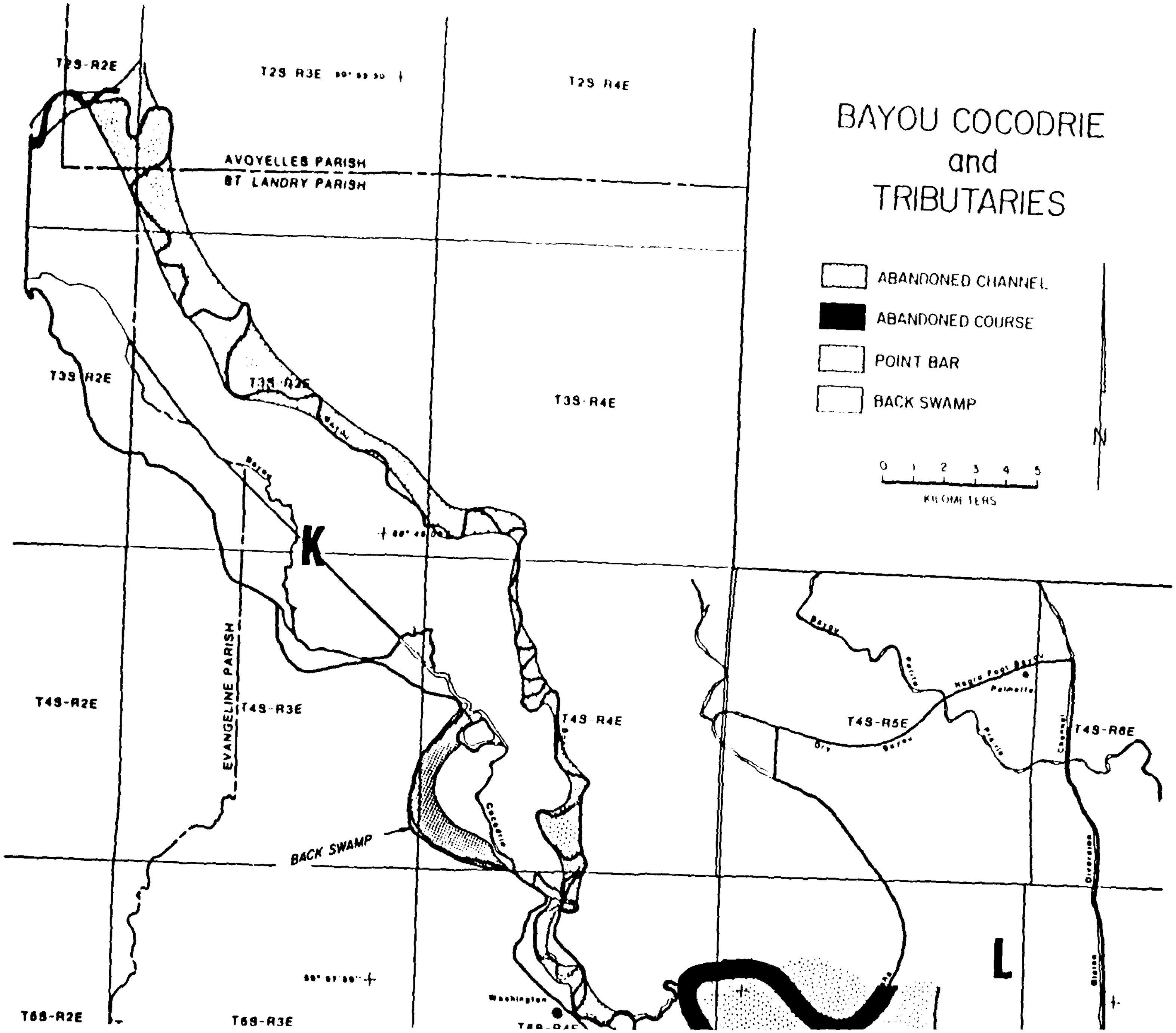
BAYOU COCODRIE
and
TRIBUTARIES
ABANDONED CHANNEL
ABANDONED COURSE
POINT BAR
BACK SWAMP
0 1 2 3 4 5
KILOMETERS
N
T2S-R2E
T2S R3E
T2S R4E
AVOYELLES PARISH
ST LANDRY PARISH
T3S-R2E
T3S-R3E
T3S-R4E
K
EVANGELINE PARISH
T4S-R2E
T4S-R3E
T4S-R4E
T4S-R5E
T4S-R6E
BACK SWAMP
Cocodrie
Negro Foot Bayou
Palmetto
Dry Bayou
Channel
Diversion
Washington
L
T6S-R2E
T6S-R3E

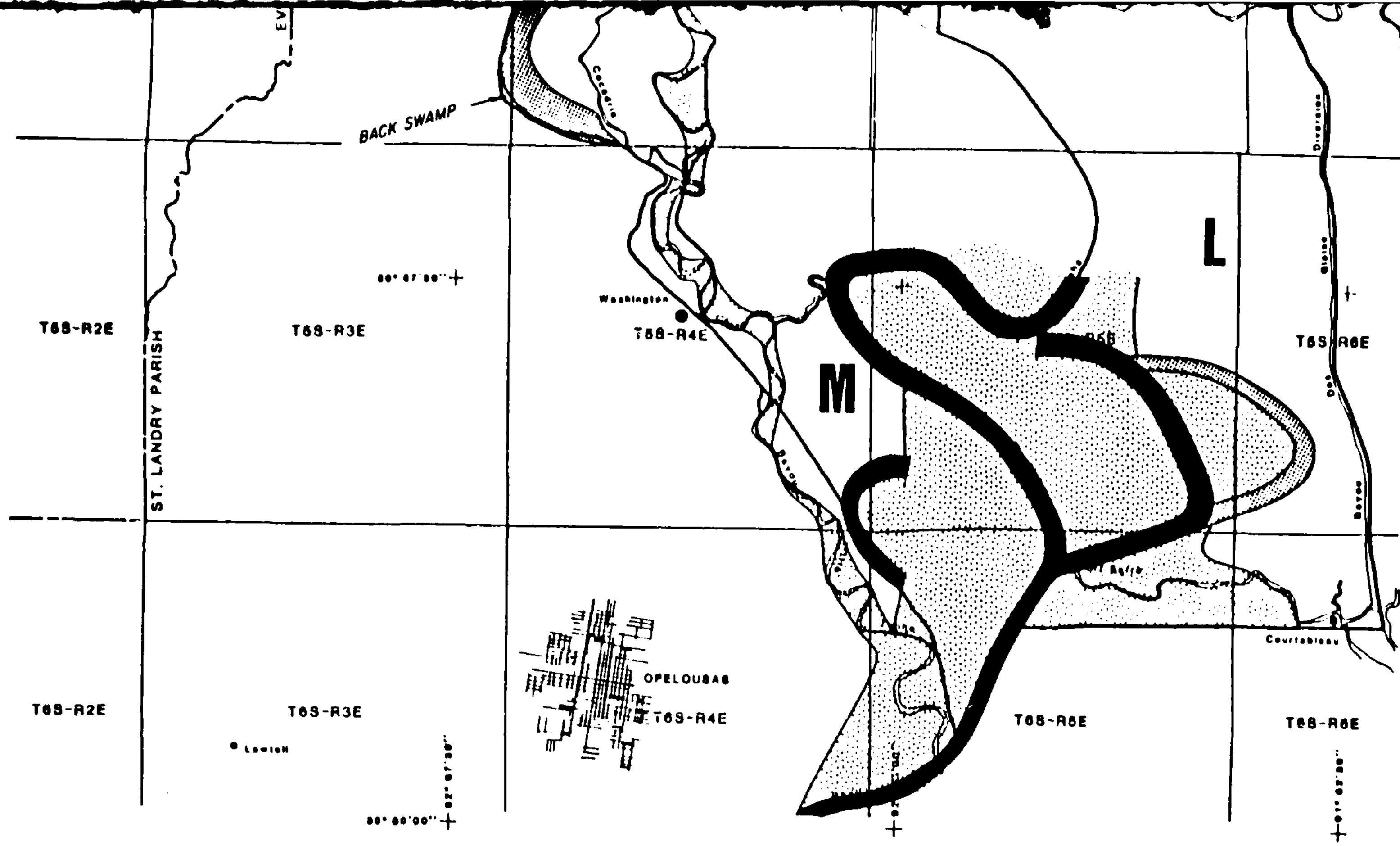

Figure 2. Distribution of the geomorphological strata within the Bayou Cocodrie and Tributaries Project area (after USACOE 1982).

courses, abandoned channels, and point bars throughout the study area. The southern and western margins of this reach contain deposits related to the Boeuf-Red River episode. Bayous Courtableau and Wauksha have reoccupied abandoned courses associated with this episode (USACE 1982). These Red River deposits overlie earlier materials related to a crevasse distributary channel of the Teche-Mississippi (Gagliano et al. 1978:25-27). Boeuf-Red materials may also be located along the eastern margin of the reach, having entered through Big Darbonne Bayou (Gagliano et al. 1978:27). Small portions of these Red River deposits lie within the three-year flowline. The northern section of the reach contains the relict abandoned course and associated point bar deposits of the Petite Prairie-Red depositional episode (Gagliano et al. 1978:22). None of these earlier Red River deposits lie within the three-year flowline.

In Reach M, an abandoned course and associated point bar deposits of the Teche-Mississippi episode occur (Gagliano et al. 1978:22). Portions of these deposits represent the crevasse distributary channel noted above. Within this relict course, materials related to the Boeuf-Red River episode can be expected along the present course of Bayou Courtableau (USACE 1982, Gagliano et al. 1978:22). Earlier Red River deposits, associated with the Wauksha episode, occur along Bayou Carron in the form of an abandoned course and point bar formation. All of these deposits lie within the three-year flowline.

Soils in the Project Area

Most soils in the study area belong to the Gallion association, although Moreland-Portland, Baldwin-Cypremort, Sharkey, Latanier, Alligator, and Iberia soils are also represented. Gallion soils, which comprise the soils of the Red River floodplain, occur on nearly level and gently undulating surfaces of the natural levees and flood plains of Reach K, and along Bayou Courtableau in Reaches M and L (USDA 1970).

Relationships between the soil associations and the geomorphological strata defined above are not easy to define. Correspondences between fluvial features and soils associations are not diagnostic nor are they mutually exclusive. In addition, the presentation of the soils data at the association level (USDA 1970), encumbers their use as viable criteria for stratification in the present study. The distributions of soils within the project areas are presented below, to provide some idea of the possible land use which may occur within the reaches. The distributions of these soil associations within Reaches K, L, and M are shown in Figure 3. Table 3 summarizes these distributions by reach and outlines the limited relationships between the soil

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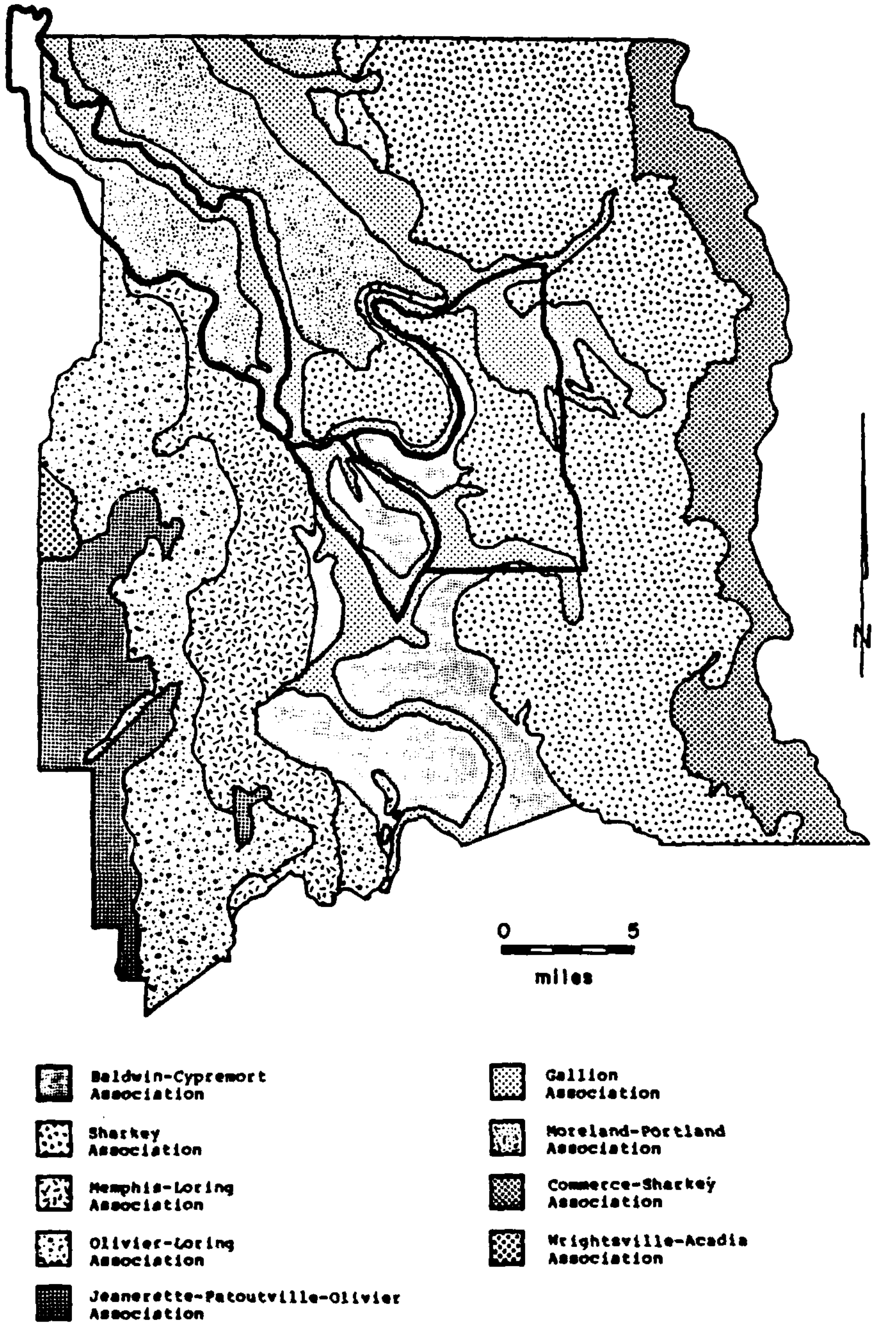

Figure 3. Distribution of the soil associations within the Bayou Cocodrie and Tributaries Project area (after USDA 1970).

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Table 3. Soil Types Located In Bayou Cocodrie And Tributaries Study Area (after USDA 1970).

Association	Reach	Stratum	Recommended Usage
Baldwin-Cypremort	M, L	Point Bar Abandoned Course Abandoned Channel Backswamp	Cropland
Sharkey	L	Point Bar Abandoned Course Backswamp	Woodland/Wildlife Habitat
Gallion	K, M, L	Point Bar Abandoned Course Abandoned Channel Backswamp	Cropland
Moreland-Portland	K	Backswamp Abandoned Channel	Hardwood Forest/ Cropland where well drained

associations and the geomorphological strata defined above.

Reach K

Reach K consists of soils of the Gallion and Moreland-Portland associations. The Gallion association comprises loamy soils occurring on the natural levees and flood plains of Bayous Boeuf, Courtableau, Wauksha, and others in this reach. These soils occur primarily on the abandoned course and point bar deposits associated with Boeuf-Red River episode along Bayou Boeuf. Gallion soils are best utilized as cropland. Gallion soils make up 90 per cent of this association, with Latanier-Moreland making up most of the remaining 10 per cent (USDA 1970).

The Moreland-Portland association is located in the broad areas of backswamp within Reach K. This is the broad, level area comprising the basin between Bayou Boeuf and Bayou Petite Prairie east of Bayou Cocodrie, and between the Quaternary Prairie Terrace and Bayou Cocodrie on the west. The Moreland-Portland association is primarily covered with hardwood forests, but it is increasingly being cleared for use as cropland. Moreland soils occur on level to slightly convex slopes at high elevations. They account for approximately 70 per cent of this association. Portland soils occur on level to slightly depressed areas and account for approximately 20 per cent of this association. Gallion-Latanier soils comprise the remaining 10 per cent (USDA 1970).

Reach L

Reach L is comprised of the Gallion, Baldwin-Cypremort, and Sharkey associations. Like the Baldwin-Cypremort association, Sharkey soils are clayey soils characteristic of the Mississippi River flood plain. Sharkey soils occur in the broad basin west of the Atchafalaya River's natural levee. This is a large area of level to depressed backswamp soils occurring at low elevations. Within the project area, these soils appear to be associated with the Teche-Mississippi episode of deposition. Most of this basin is in hardwood forests, though a large portion of this reach recently has been cleared for use as cropland. Sharkey soils make up 80 per cent of this association, with the Gallion, Baldwin, and Cypremort soils comprising the remaining 20 per cent (USDA 1970).

Baldwin-Cypremort association soils occur along the natural levees of Bayou Wauksha. These soils would be associated with the abandoned course and point bar deposits related to the Teche-Mississippi episode along this Bayou and throughout the western portion of the reach. Along Bayous Courtableau and Wauksha are thin strips of Gallion association soils as well. As stated above, these soils cover the abandoned course deposits associated with the Boeuf-Red episode. These deposits lie within the earlier abandoned course associated with the Teche-Mississippi episode along both of these bayous.

Reach M

Reach M is comprised of soils of the Gallion and Baldwin-Cypremort associations. As noted above, Gallion soils are associated with depositional episodes of the Red River. The Baldwin-Cypremort association comprises clayey and loamy soils characteristic of the Mississippi River floodplain. In this reach, they appear to be associated with the Teche-Mississippi episode of deposition overlying the abandoned course, point bar, and backswamp deposits associated with this period. These occur in areas that are level or gently undulating, and occupy the natural levees of Bayou Teche. These soils are best suited for cropland. Baldwin soils occur on the middle and lower parts of the natural levees and make up about 50 per cent of the association. The nearly level Cypremort soils are found on the highest part of the natural levees, and they account for roughly 30 per cent of the association. Alligator and Iberia soils make up most of the remaining 20 per cent (USDA 1970). Soils of the Gallion association lie along Bayous Courtableau and Teche in the northern and eastern portions of the reach along the abandoned courses of the Red River which reoccupied the earlier Teche-Mississippi meander course. In addition, these soils overlie the abandoned course and point bar deposits along Bayous Carron and Little Teche which represent the Wauksha-Red episode of deposition along the western boundary of the reach.

Floral and Faunal Associations in the Project Area

The forested portions of the project area contain floral elements associated with bottomland hardwood forests. These include: oaks (*Quercus* spp.), red maple (*Acer rubrum* var. *drummondii*), willow (*Salix nigra*), elm (*Ulmus americana*), box elder (*Acer negundo*), cottonwoods (*Populus* spp.), dogwood (*Cornus drummondii*), persimmon (*Diospyros virginiana*), hackberry (*Celtis laevagata*), ash (*Fraxinus* spp.), and privet (*Foresteria acuminata*). Lower and wetter portions of these bottomland forests contain tupelo (*Nyssa aquatica*) and bald cypress (*Taxodium distichum*). Drier portions of the project area, such as along the levees of the larger bayous and on the adjacent Quaternary Prairie Terrace, contain most of the common species listed above plus hickories (*Carya* spp.) and sweetgum (*Liquidambar styraciflua*) (Bahr et al. 1983:43-45, 82). Woodland areas provide suitable habitats for dove, quail, deer, rabbits, squirrel, and other small furbearers (Lowery 1974).

Historic sources (e.g., Darby 1816 or Robin 1807) indicate that the prairie characteristic of southwestern Louisiana extended east to Opelousas and the vicinity of Bayou Courtableau near Port Barre. These prairies were located behind the natural levees flanking bayou courses. The natural plant community occupying the bayouside levees is dominated by bottomland hardwood forest described above. Larger game species formerly inhabiting the area included white-tailed deer, bobcat, cougar, and black bear (Shelford 1963:100).

CHAPTER III

THE PREHISTORIC SETTING

Previous Investigations

Archeological investigations in this portion of Louisiana date from the early nineteenth century. William Darby (1818:70) reported the presence of small mounds between Bayous Courtableau and Teche in his descriptions of the southwestern and western states and territories. The next discussion of archeological sites in the area is by Humphreys and Abbot (1861:433) who reported the presence of small mounds north of the community of Courtableau (16SL11).

The majority of the archeological work done in the area has occurred in the last decade in response to federal legislation requiring the assessment of impacts to the archeological resource base. For the most part, these investigations have consisted of survey projects designed to locate archeological sites prior to the construction of pipelines, canals, or roadways which crossed through or near the project area.

In 1974, Neuman conducted a survey of Bayou Plaquemine Brule Watershed. The following year, Gibson carried out three surveys within or near the project area. These included a bankline survey (by boat) of Bayou Teche, the Vermilion River, and Freshwater Bayou (Gibson 1975a); a survey and assessment of sites in eastern Rapides and south central Avoyelles Parishes which included portions of Bayous Cocodrie and Courtableau and the Chatlin Lake Canal (Gibson 1975b); and an assessment of Bayous Rapides, Boeuf, and Cocodrie (1975c). While few sites were discovered along the Bayou Teche during Gibson's (1975a) initial study, it does represent the first attempt to identify environmental variables which may be employed to predict site locations in the region.

During 1976, four surveys were conducted in the region. These included Gibson's (1976) survey of historic structures and potential archeological sites in Washington, Louisiana; Gagliano et al.'s (1976) survey of the Colonial Pipeline Company's pipeline right-of-way from East Feliciana Parish, Louisiana, to Orange County, Texas; Neitzel's (1976) survey of an underground waterline from the west of Washington to the south of Port Barre, Louisiana; and Saltus et al.'s (1976) feasibility study of the North-South Expressway alignments near Opelousas and Alexandria, Louisiana. Only Saltus et al. (1976) recorded two new prehistoric sites in the area (16SL40 and 16SL43).

Several small surveys were conducted by Gibson (1977) during the following year. No new sites were discovered during these investigations, prompting Gibson (1977:2) to conclude that sites older than a few hundred years were likely to be buried by recent alluvium.

During 1978, reports of surveys by Heartfield et al. (1978) and Gagliano et al. (1978) appeared. The former recorded several historic sites and a Coles Creek period village along the North-South Expressway corridor between Opelousas and Shreveport. Gagliano et al. (1978) produced the report of their survey of the Teche-Vermilion Conveyance Channel. The analysis included an intensive examination of the geological history of the area which associated the deposits in the area with various depositional episodes of the Mississippi and Red Rivers. The authors attempted to associate the initial occupations of prehistoric sites throughout the area with active phases of the deposits on which they occurred. This represented the second attempt to identify man-land relationships which would permit the prediction of site locations in the project area.

Over the next four years, surveys by Heartfield, Price and Greene, Inc. (1979, 1982), McIntire (1980), and Swanson (1982) failed to identify any further prehistoric sites in the immediate area. These surveys all examined specific project-defined areas.

The most recent archeological work was conducted by Goodwin et al. (1986) along the Bayou Courtableau Enlargement Project corridor. Seven new prehistoric sites (16SL77, 16SL78, 16SL81, 16SL82, 16SL84, 16SL85, 16SL87) were discovered along Bayou Courtableau. One of these sites (16SL84) was a secondary deposit while two others (16SL78 and 16SL82) produced one prehistoric sherd each. This survey attempted to use previous topographical or geomorphological associations noted by Gibson (1975a) and Gagliano et al. (1978) to define areas of high probability for the location of prehistoric sites. The survey results did not confirm the hypotheses concerning site locations. This represented the latest attempt to identify man-land relationships within the general area.

General Prehistoric Cultural Sequence

With the exception of the Gagliano et al. (1978) study that related prehistoric occupations in the region containing the project area to riverine processes and features, and of the recent survey report for the Bayou Courtableau area (Goodwin et al. 1986) that provided a preliminary test of Gagliano's observations, most of what is known about the prehistoric archeology of the Bayou Cocodrie and Tributaries study area is derived from the literature on cultural chronology of the larger region. The following paragraphs present a synopsis of that prehistoric sequence. A summary of the relationships between prehistoric temporal phases and past depositional episodes is displayed in Table 4.

The earliest well defined archeological evidence of human habitation in North America is represented by the Paleo-Indian stage. A date range of 10,000-8,000 B.C. has been suggested for Paleo-Indian occupation of the Lower Mississippi River alluvial valley (Brain 1971:3). Archeological evidence from the western United States indicates that Paleo-Indians were semi-nomadic big game hunters. The material culture of the Paleo-Indian period is best exemplified by the manufacture of large, thin, bifacially-worked lanceolate projectile points which had a "fluted" or channel flake scar at their base. Fluted point complexes include the Llano, Clovis, Folsom, and Plano traditions (Willey 1966). Three archeological sites in Avoyelles Parish, 16AV6(USL), 16AV7(USL), 16AV11(USL), contain Late Paleo-Indian projectile point types, and two are located on Quaternary Prairie Terrace features.

The following Archaic stage reflects cultural adaptations to climatological change occurring after the retreat of the last Pleistocene glaciation (ca. 8,000 B.C.). Critical environmental changes influencing human adaptation during the Archaic period have been summarized by Bryant et al. (1982:21-22) as follows:

> 1. The extinction, without replacement, of much of the Pleistocene megafauna, including the elephant, horse, and camel, and most of the Bison species on which the Lithic stage economy had been largely based.
>
> 2. Certain fluctuations in rainfall and temperature as yet only partly understood but presumed to relate to worldwide climatic changes and to be generally correlated with glacial retreat and oscillations.
>
> 3. The plant and animal recolonization of the areas of North America which were previously glaciated, and establishment of the modern geographical position of the major North American lifezones.
>
> 4. The changing volume and gradient of river systems draining eastern North America generated by worldwide deglaciation and rising sea levels.

Archaic cultural complexes are represented by localized

Table 4. Major Meander Belts and Associated Prehistoric Cultural Phases (after Gagliano et al. 1978).

Meander Belt or Course	Initial Cultural Association
Bayou Tortue-Miss. (8,500-6,000 B.P.)	Late Paleo-Indian to Early Archaic
Early Teche-Miss. Late Teche-Miss. (6,000-4,000 B.P.)	Middle to Late Archaic, Late Archaic to Poverty Point
Waukhsha-Red (5,400-3,00 B.P.)	Late Archaic (?) to Poverty Point (?)
Petite Prairie-Red (4,000-2,200 B.P.)	Poverty Point (?) to Tchefuncte
Bouef-Red (1,500-500 B.P.)	Coles Creek

stone tool traditions which are thought to represent regional adaptations to different local environmental conditions (Bryant et al. 1982:22). Projectile point types found in early Archaic sites include San Patrice, Meserve and Dalton. A shift towards exploitation of smaller and more varied game occurred along with an increase in gathering of plants and previously ignored animal species, such as shellfish. Archaic subsistence patterns became increasingly more efficient with advances in technology which included ground stone tools, such as adzes and metates, and the use of the atlatl (spear thrower). Common point types for the Middle Archaic are Big Sandy, Keithville, Yarbrough, Evans, and Carrollton. A gradual settlement pattern shift from semi-nomadic to seasonal site occupancy to semi-permanent settlement is evidenced during the Archaic (Willey 1966).

Reach K contains two areas of sufficient age where it is reasonable to expect sites from the Paleo-Indian and Early Archaic periods to occur. One obvious area of possible site occurrence is the Quaternary Prairie Terrace-backswamp interface. The second area in Reach K where the surface is of sufficient age to bolster the expectation of Paleo-Archaic site occurrences is the area occupied by the abandoned channel stratum. This abandoned channel is a relict formation which survives from the Bayou Tortue-Mississippi meander belt, which was active from 8,500 to 6,000 B.P.

Reach L also contains surfaces old enough to support the possibility of Archaic site representation. 16SL16 is an Archaic site which occurs on a point bar-abandoned course boundary in this reach. 16SL19 is another Archaic site which occurs in Reach L. Its location on the point bar stratum in this reach suggests that this point bar deposit is of sufficient age to reasonably expect the occurrence of other Archaic sites on it. The geologic evidence also lends support to this assumption. Extensive point bar and abandoned course deposits from the Teche-Mississippi meander belt (6,000-4,000 B.P.) are still extant on the surface and argue favorably for this supposition.

Four Archaic period sites lie to the north of the project area. Two of these sites [16AV5(USL) and 16AV9(USL)] lie on a remnant of the Quaternary Prairie Terrace called Gum Ridge. Sites 16AV12(USL) and 16AV13(USL) lie on point bar deposits associated with an abandoned course identified as early Teche-Mississippi episode by Gagliano et al. (1978:62).

The appearance of earthwork and burial mound construction in the late Archaic marked the development of the Poverty Point culture in Louisiana, ca. 1,500 B.C. Considered to be either an Archaic-Formative transition or an Archaic climax phenomenon, the Poverty Point site (16WC5), located in West Carroll Parish, is unique in North American prehistory. Although small quantities of fiber-tempered pottery are present at the Poverty Point site, some scholars argue that the culture was aceramic. Nevertheless, crude pottery figurines and irregular-shaped fired clay objects, possibly used in "stone boiling" cooking techniques occur in Poverty Point contexts (Bryant et al. 1982:23). Poverty Point material culture also is represented by fine stone lapidary work, steatite or soapstone vessels, and a microlithic tool industry. Subsistence appears to have been based on intensive hunting and gathering, although prior emphasis on protein capture may reflect bias in archeological study of the Poverty Point period. Projectile point types originating in the Late Archaic and continuing into the Poverty Point period are Gary, Ellis, Pontchartrain, Kent, Carrollton, and Marshall, as well as larger forms such as Hale.

The late Teche-Mississippi meander belt (6,000-4,600 B.P.) was active during the initial period of the Poverty Point phase. Deposits relating to this episode are present in Reaches L and M in the form of abandoned courses and associated point bars. The Wauksha-Red meander belt (5,400-3,900 B.P.) and the Petite Prairie-Red (4,000-2,200 B.P.) meander belt were active during the Poverty Point period. Reaches K and M contain deposits or features related to the Wauksha-Red episode. Reach L contains materials associated with the Petite Prairie-Red episode. None of the latter materials lie within the three-year flowline. Four sites [16SL1, 16SL4, 16AV15(USL), and 16SL30(USL)] near the project area have been associated with the Poverty Point culture. One of these sites [16AV15(USL)] has been associated with an abandoned course of the Teche-Mississippi episode as identified by Gagliano et al. (1978:62).

The next stage in the chronological sequence for the region is called the Neo-Indian era. The appearance of pottery in the archeological record is generally used to mark the beginning of this era. Changes in settlement patterns from semi-permanent to permanent villages, and the introduction of agriculture, characterize Post-Archaic periods (Willey 1966). The most frequently applied regional chronology of the Neo-Indian era in South Louisiana includes the following periods.

The first is the Tchula period, represented in virtually all of Louisiana by the Tchefuncte culture, dated from ca. 500-200 B.C. During this period, pottery became increasingly important in prehistoric Louisiana, and vessels with tetrapodal supports were commonly made. The soft Tchefuncte pottery had poorly compacted paste, and common vessel forms included bowls and cylindrical and shouldered jars. Decoration included rocker stamping, fingernail and tool punctation, incision, simple stamping, drag and jab, parallel and zoned banding, and stippled triangles (Phillips 1970). Tchefuncte pottery apparently derived from and was genetically related to earlier ceramic complexes at Stallings Island, Georgia, Orange in North Florida, and to the Poverty Point culture. Ford (1969:193) speculated that commonalities in ceramics across the Gulf South states during this period reflected the breakdown of ethnic barriers due to the powerful influence of the arrival of maize (corn) agriculture. Gibson (1978) argued strongly against the presence of maize throughout the Lower Atchafalaya prehistoric sequence, leaving the reasons for the diffusion of ceramics into this area unexplained.

The Tchefuncte artifact assemblage includes boatstones, grooved plummets, mortars, sandstone saws, barweights, scrapers, and chipped celts. Socketed antler points, bone awls and fish hooks, and bone ornaments also have been found. Projectile point types found in Tchefuncte contexts are Gary, Ellis, Delhi, Motley, Pontchartrain, Macon and Epps. The population of the Tchefuncte period appears to have been a melange of long-headed Archaic peoples with a new subpopulation of broad-headed people who practiced cranial deformation, and who have been conjectured to have entered the southeast from Mexico (Willey 1966). The presence of rocker stamped pottery, burial mounds, and of some other individual traits, also shows similarities to the Midwestern Hopewellian development. Two sites [16SL23(USL) and 16SL3] near the project area contain Tchefuncte materials. Both are associated with an abandoned course identified as Teche-Mississippi by Gagliano et al. (1978:62). Given the repeatedly demonstrated affinity of this culture for at least seasonal exploitation of wetland resources, some representation might well be expected in the present project area.

The subsequent Marksville period (ca. 200 B.C. - 400 A.D.) to a large degree is a localized hybrid manifestation of the Hopewellian culture climax that preceded it in the Midwest. The type site (16AV1) is located at Marksville, Louisiana, which is only about 50 kilometers (ca. 30 miles) north of the present project area. Elsewhere in the state, smaller sites occur which display both Marksville pottery types and a modified form of the Marksville mortuary complex. Marksville houses appear to have been circular, fairly permanent, and possibly earth covered. The economic base of the Marksville culture seems to be a further modification of the Poverty Point - Tchefuncte continuum, albeit prior emphasis on the importance of hunting, fishing, and gathering aspects of subsistence in relation to agriculture may have been overstated. A fairly high level of social organization is indicated by the construction of geometric earthworks and of burial mounds for the elite, as well as by a unique mortuary ritual system. Although large quantities of burial furniture are not recovered from Marksville sites, some items, particularly elaborately decorated ceramics, were manufactured especially for inclusion in burials (Haag 1971).

Marksville ceramics were well-made, with decorations that included u-stamped incised lines, zoned dentate stamping, zoned rocker stamping (both plain and dentate), the raptorial bird motif, and flower-like designs (Phillips 1970). The cross-hatched rim is particularly characteristic of Marksville pottery, and may relate this complex to other early cultural climaxes in the Circum-Caribbean area. Plain utilitarian wares also were produced. Perforated pearl beads, bracelets, and celts have been recovered from Marksville contexts. Three Marksville period sites [16SL25(USL), 16SL28(USL), and 16SL8] are known near the project area. Since the type site is not far away, as noted above, other closely related sites might be expected in this vicinity.

All of the cultural manifestations noted above are contemporary with the Petite Prairie-Red depositional features. As previously noted, these deposits occur in Reach L outside the three-year flowline. 16SL8 lies on the Quaternary Prairie Terrace north of the town of Washington. 16SL25(USL) and 16SL28(USL) lie to the north of the project area along abandoned course deposits associated with the Teche-Mississippi and Petite Prairie-Red episodes respectively.

The next cultural period identified for south Louisiana is Troyville (ca. A.D. 400-700; generally referred to as Baytown in the northern Lower Valley). This period followed the decline of the Hopewellian Marksville culture, and is poorly understood. In addition to the type site at Jonesville (16CT7), formerly Troyville, Louisiana, knowledge of the Troyville culture is based on excavations at the Greenhouse site (16AV2) immediately north of Marksville, the Gold Mine site (16RI13) in northeast Louisiana, and the discovery of Troyville ceramics in other sites. Among the pottery types clustering in the Troyville period are: Troyville Stamped, Mulberry Creek Cord Marked, Marksville Incised var. Yokena, Churupa Punctated, Larto Red Filmed, Landon Red-on-Buff, and Woodville Red Filmed (Phillips 1970). However, these pottery types and most other traits are not confined solely to this period. Troyville is thought to represent the period when the bow and arrow were adopted, and has been suggested as the time when maize agriculture began in earnest (Phillips et al. 1951). Direct evidence for agriculture has proved elusive, though.

Population growth during this period may be indicated by an increase in the number of sites in the Lower Atchafalaya Basin area. This increase, though, also may reflect survey methodology. Sites at Oak Chenier (16SMY49) and at Bone Point (16SMY39) suggest that Troyville subsistence included the capture of large fishes, aquatic reptiles, deer, and small mammals (Gibson 1978:35). Three Troyville period sites (16SL41, 16SL78 and 16SL82) are located in the region containing the Bayou Cocodrie and

Tributaries project area. Two additional Troyville sites (16SL7 and 16SL24) lie to the east of Reach L on Bayou Petite Prairie. The proximity of a major center (the Greenhouse site, 16 AV2, approximately 50 kilometers away) alerts one to the possibilities for related sites here.

The subsequent Coles Creek period (ca. A.D. 700-1200) developed out of Troyville. Coles Creek was a dynamic and widespread manifestation throughout the lower Mississippi Valley. Coles Creek may be viewed as the local early or pre-classic variant of the Mississippian tradition, and its emphasis on temple mound and plaza construction, best exemplified in this region at the Greenhouse site (16AV2), again suggests Mesoamerican influence. Population growth and areal expansion were quite possibly due to increasing reliance on productive maize agriculture; again, direct evidence is lacking, but this may be a function of recovery and analytical techniques. The seasonal exploitation of coastal areas supplemented the economy of large inland sites, and small non-mound farmsteads were present. A stratified social organization with a dominant priestly social class may be inferred. The construction of platform mounds became important during this period. These were intended primarily as bases for temples or other buildings, but also contained burials. Rounded smaller mounds were still present (Haag 1971). A common and distinctive motif of Coles Creek ceramics is a series of incised lines parallel to the rim (varieties of Coles Creek Incised). Other pottery types include Mazique Incised var. Mazique, varieties of French Fork Incised, and (essentially unique to the southern Louisiana regions) Pontchartrain Check Stamped (Phillips 1970). Coles Creek period sites present in or near the Bayou Cocodrie and Tributaries study area include 16SL4, 16SL9, 16SL11, 16SL15, 16SL20(USL), 16SL21, 16SL23, 16SL24, 16SL28, 16SL30, 16SL31, 16SL33, 16SL43, 16SL77, 16SL81, 16SL84 and 16SL87. The cultural affiliation of the four latter sites are drawn from Goodwin et al. (1986:248). Once again, an important center (the Greenhouse site, 16AV2) is within 50 kilometers (ca. 30 miles), and may well have included the project area in its "social catchment."

In the southern part of the lower Mississippi Valley, the Plaquemine culture developed out of a Coles Creek background. Ceremonial sites of this period consisted of several mounds (some of them quite large) arranged about a plaza area. Associated small sites were dispersed about such centers. Social organization was probably stratified (Kniffen 1936). There is a fair amount of indirect evidence for agriculture during this period, but once again, direct evidence is scarce, perhaps reflecting the lack of intensive modern excavations with emphasis on flotation and related analyses.

The most widespread decorated ceramic type of the Plaquemine period was Plaquemine Brushed. Other types include Harrison Bayou Incised, Coles Creek Incised var. Hardy, L'Eau Noire Incised, Mazique Incised var. Manchac, and Evansville Punctated. Some of these represent a deterioration from finely-made Coles Creek period ceramics. The characteristic plainware, Addis Plain, was tempered with various materials, including organic substances. Vessel shapes included bag-like jars, carinated bowls, and "platters" (Phillips 1970). Diagnostic Plaquemine projectile points are small and stemmed with incurved sides in some regions; in others, points are essentially absent and it is believed that cane points were used (Phillips et al. 1951). Four sites in the vicinity of the project area contain materials associated with the Plaquemine period (16SL77, 16SL81, 16SL84 and 16SL87 after Goodwin et al. 1986:248).

Late in the prehistoric period, the indigenous Plaquemine culture came under the influence of Mississippian cultures from the middle Mississippi River valley. Mississippian culture was characterized by large mound groups, a widespread distribution of sites, and shell-tempered pottery. A mortuary cult or complex, called the "Southern Cult," that made use of distinctive artistic motifs and elaborate ceremonialism, found from Oklahoma to Georgia, seems to have characterized the Mississippian frontier or interaction zone (Willey 1966). Some examples have been found in Plaquemine sites. Trade networks were well established during this period, and raw materials and specialty objects were traded across large areas of the central and southern United States. Seven sites associated with the Mississippi period are located near the project area. These include 16SL2, 16SL10, 16SL22, 16SL29, 16SL32, 16SL41, and 16SL87. The cultural affiliations of these sites are drawn from Gagliano et al. (1978:62) and Goodwin et al. (1986:248).

Troyville, Coles Creek and Plaquemine period occupations would have been contemporary with the active period of the Boeuf-Red River meander belt (1,500-500 B.P.). Such deposits are present in Reaches K, L, and M. These deposits occur within the three-year flowline in Reach L along Bayous Courtableau and Big Darbonne and in Reach M along Bayou Courtableau.

During the French and Spanish occupation of Louisiana, St. Landry Parish was part of the Attakapas District. The earliest recorded historic Indian groups in the study area were the Attakapas and Opelousas Indians. Although horticulture was practiced by the Attakapas, hunting, gathering, and fishing dominated their subsistence pattern. Of the three major bands of the Attakapas Indians in Louisiana, the two easternmost groups more closely resemble other lower Mississippi River valley cultural manifestations. The western group, located in the Mermentau basin, developed a distinct social and material culture.

In the mid-nineteenth century the Attakapas abandoned their villages. Although the ultimate fate of the tribe is unknown, it is assumed that they assimilated with other Indian groups and were acculturated into Neo-American culture. The Opelousas Indians, one of the five Attakapas tribes, lived in the area of present Opelousas, Louisiana. According to Kniffen (1938), the Opelousas also lived on Bayou Plaquemine Brule and "the other parts north and west of that bayou" (viz. Swanton 1911:364). Their fate is surmised to have been similar to that of other Attakapas groups.

Eleven sites of unknown affiliation have also been reported in or near the project area. These include: 16SL22(USL), 16SL25(USL), 16SL30(USL), and 16SL31(USL) on the Quaternary Prairie Terrace to the south; 16AV8(USL) and 16AV10(USL) on the Quaternary Prairie Terrace to the north; 16SL26(USL), 16SL27(USL), 16SL29(USL), and 16SL30(USL) on a Petite Prairie-Red abandoned course (Gagliano et al. 1978:62) to the north; and 16SL54 on a Teche-Mississippi abandoned course (Gagliano et al. 1978:62) to the north of the project area.

Hypothesized Man-Land Relationships

It has been assumed that elements of the floodplain geomorphology within the project area have influenced the nature and distribution of human activities that occurred in this region. Those attributes of each geomorphological stratum which contribute to the differences between the strata are summarized in Chapter II. Before relating these attributes to human activities, it is necessary to consider how prehistoric human groups may have utilized the alluvial floodplain. In addition, a brief discussion of subsistence patterns and their associated spatial organizations is in order. These attempts at model-building are drawn from theoretical discussions of hunter-gatherer settlement and subsistence organization currently circulating in archeological literature (e.g., Binford 1979, 1980; Jochim 1976, 1981; Keene 1979, 1981; Winters 1969; Yellen 1976).

Prehistoric utilization of the alluvial floodplain within the Bayou Cocodrie and Tributaries project area is assumed to have consisted primarily of the acquisition of resources through hunting and gathering. While later prehistoric populations in the region are assumed to have practiced some agriculture, the extent of this dependence on food production is unknown (Byrd and Neuman 1978). The continued utilization of uncultivated resources throughout much of the Middle Woodland period in the Illinois basin and Mississippi period in the Mississippi basin has been noted by Struever (1968) and Smith (1975), respectively. Byrd and Neuman (1978) stress this same emphasis for most of the prehistoric periods in the lower Mississippi valley. In addition, Gibson (1978) has argued strongly against the presence of maize agriculture throughout all periods in the prehistoric sequence of the lower Atchafalaya basin. Therefore, the assumption of resource acquisition through hunting and gathering by most of the prehistoric occupants of the project area is not unfounded. Such assumptions have been employed successfully for analyses of the settlement and subsistence patterns in the Ouachita River valley in southeastern Arkansas (Hemmings 1981; Weinstein and Kelley 1984). Further data are necessary to demonstrate conclusively the subsistence base of later prehistoric peoples in the region.

Most of the land surfaces extant within the present project area are less than 6,000 years old (Teche-Mississippi episode of deposition). During this period, climatic conditions have approximated the present conditions (Haag 1978:3). This general continuity and lack of rapid changes would permit the assumption of a fairly stable resource base for prehistoric hunter-gatherers in the region throughout this time span.

Exploitation of this hypothesized stable prehistoric resource base is assumed to have been similar throughout this period. While technological changes and population aggregation may have permitted different approaches to the acquisition of some resources by later prehistoric peoples, the stable nature of most resources in the floodplain would permit the continued use of efficient techniques for their recovery. As an example, the search by one or two individuals for a particular resource which is widely scattered and in small allotments (e.g., deer throughout most of the year) would remain an efficient approach for the acquisition of such resources despite the size of the human group from which the hunters originated. Therefore, it will be assumed that the nature of resource acquisition remained fairly constant. The contribution of each resource will have varied as additional resources (e.g., agricultural products) became components of a prehistoric group's subsistence base.

Given the assumed continuous orientation of utilization of the region throughout the past 6,000 years, the nature and distribution of human activities is assumed to have been fairly constant with respect to time. The distributions of the residues of these activities should be similar through time if this assumption is valid. The nature of these residues (i.e., kinds of artifacts, styles of projectile points, pottery types, etc.) will vary with the function of the locale or the temporal affiliation of the prehistoric human group responsible for their deposition. Hemmings (1981:269) suggests that this assumed continuous orientation is likely in floodplain bottomlands of the lower Mississippi valley.

Binford (1980) defines two types of spatial organizations for hunter-gatherers. The first type results from a "foraging" strategy of resource acquisition. These strategies produce two kinds of sites: locations (resource extraction sites), and residential base camps (maintenance sites) (Binford 1980:9). Such strategies are most frequent among groups occupying tropical forests and deserts. The second organization results from a "logistical" strategy of resource acquisition. These strategies produce five kinds of sites: locations, residential bases, field camps, stations, and caches (Binford 1980:10). The latter kinds of sites permit the acquisition of critical resources under conditions where access to multiple resources is limited or mobility is restricted. Such strategies are more common among hunter-gatherers who occupy higher temperate, boreal, or arctic environments.

The distinction between two types of sites will be employed in the following discussions. These are resource extraction sites (Binford's [1980] "locations") and maintenance sites (Binford's [1980] "residential base camps"). While a more logistical approach may be applicable to later prehistoric occupants of the lower Mississippi Valley (see Hemmings 1981:271), the criteria for recognizing the additional kinds of sites associated with logistical strategies in the archeological record are weak at present. In addition, the additional site types are associated hierarchically with the two types of sites accepted for discussion. Therefore, a dichotomous organization of site types is appropriate.

Resource extraction sites represented the scenes of activities related directly to the acquisition of some food resource or raw material. The artifacts deposited at these sites would be related to this acquisition. The location of these sites would be at or near the locus of the particular resource being exploited by the prehistoric occupants. Normally, such sites represent relatively short-term occupations (i.e., measurable in days). Artifact densities would be low unless the site was reoccupied over extensive periods of time. In addition, the relatively short length of occupations would mitigate against the development of extensive midden deposits. Numerous features related to the procurement of the particular resource available at this locale may be present (after Hemmings 1981:271).

One notable exception to this trend would be lithic quarries. These resource extraction sites tend to have extremely high artifact counts and densities. Most of the artifacts would be related to the reduction of larger pieces of lithic raw material to the sizes or shapes desired by the occupants for transport to other sites. The distinction of these extraction sites from maintenance sites would be possible on the basis of the reduced diversity in artifact types. This should not present a problem to the present study since no quarry sites should be present in the alluvial floodplain which contains the project area.

Maintenance sites represented areas used as base camps. Larger groups of individuals usually occupied these areas with parties of occupants dispersing to extract locally available resources. Such sites would contain artifacts related to the processing and consumption of resources and the maintenance of items necessary for further extractive activities. Site locations would reflect other considerations besides the presence of a desirable resource (e.g., access to transportation routes, presence of potable water, sufficient area to camp for relatively long periods of time). Such sites represent relatively long-term occupations (i.e., measurable in weeks or months). These sites would be expected to contain overall higher frequencies and higher densities of artifacts and a greater diversity in artifact types (Binford 1978:483-495, 1980:18). The development of middens and multiple features would be expected for these sites as well. Sedentary villages which were established during the later prehistoric periods would fall into this category.

Both resource extraction and maintenance sites are expected to occur within the project area. The density of each kind of site is expected to vary within each geomorphological strata as a result of the attributes which distinguish one stratum from another. These attributes will influence the nature of the resources available to prehistoric groups, thereby influencing the nature and number of activities which may have occurred within a particular stratum.

The kinds of resources presently available in the alluvial floodplain, and assumed to have been present in the past, are three-fold. First, there are food resources. These can be aquatic or terrestrial with faunal and floral aspects to either group. Most of these resources are seasonal (i.e., available at limited times of the year). Some are continuously available (e.g, deer and small mammals). The qualities of these resources may vary throughout a yearly cycle (loosely after Hemmings 1981:47-50). Second, there are raw materials (i.e., resources used to make tools such as lithic materials, wood, clay, etc.). Most are inanimate materials; however, animals collected for their pelts or hides may be included in this category. Most of these materials would be available without regard to season. There may be seasonal variations in quality or access which may have limited human exploitation to certain periods of time (loosely after Hemmings 1981:50). The third group of resources are termed logistical since they represent aspects of locales which make them more attractive to human groups with regard to actual physical occupation of a site rather than consumable resources available at a particular locale (loosely after Binford 1980:12). These logistical attributes include (but need not be limited to) well-drained soils, relatively higher elevations to prevent frequent inundation, access to potable water, and access to watercourses for transportation. These aspects of a locale have been selected based on subjective requirements considered essential to long-term human occupation of a particular locale. All, with the exception of access to transportation routes, represent conditions which provide greater comfort for any human occupants of a locale. Logistical attributes in any environmental setting would provide similar comforts (e.g., the location of residential base camps near sources of firewood by Nunamiut Eskimos in Alaska, see Binford 1980:12).

Each of these kinds of resources will be itemized with respect to the geomorphological strata defined above. While not exhaustive, these itemizations should be sufficiently comprehensive to provide an adequate assessment of resource potential within the floodplain. It should be noted that the upland areas, represented by the Quaternary Prairie Terrace to the west of the project area, are not discussed below. This area would be expected to exhibit many of the attributes associated with the higher and/or drier portions of the floodplain. These would include terrestrial food resources and raw materials plus all logistical attributes except access to watercourses. Prehistoric utilization of the floodplain must be considered with this additional geomorphological feature in mind. Table 5 provides a graphic summary of the expected resources and concomitant site distributions among the four geomorphological strata and the upland terrace.

Abandoned channels should contain silts and clays representing sedimentation within oxbow lakes or abandoned meander loops since these features represent a portion of a watercourse which was cut off from the active channel prior to the abandonment of the meander belt by the parent stream (Smith et al. 1986:11-12). These areas would possess many of the attributes associated with abandoned courses while they are a part of the active stream channel. These areas are often swampy or completely underwater, however, after they are cut off, and especially so after their parent stream has abandoned the meander belt (Saucier 1974:10). Such areas would provide access to aquatic food resources (e.g., fish, reptiles, amphibians) in situations of relatively shallow and still water. Once completely cut off from the main course of the parent stream (or any subsequent streams which occupied the earlier meander belt), these features would be replenished by the seasonal flooding of the river valley. These areas would provide habitat for migratory waterfowl as well. Raw materials available in these areas would include fur-bearing mammals such as muskrat, mink, and raccoon. Few of the attributes

Table 5. Expected Resources and Site Densities among the Geomorphological Strata.

	Resources Available			Expected Site Density	
Stratum	Food Resources	Raw Materials	Logistic Attributes	Extraction	Maintenance
Abandoned channel	Aquatic	Aquatic	Few to none	Low*	Very low
Abandoned course	Aquatic terrestrial	Aquatic terrestrial	Many (e.g. dry soils, relief. Access to watercourse)	High	High
Point Bar	Terrestrial	Terrestrial	Same (e.g., dry soils, relief)	High	Moderate
Backswamp	Aquatic Terrestrial	Aquatic Terrestrial	Few	Moderate	Low
Prairie Terrace	Terrestrial	Terrestrial	Many	High	High

*Densities may be low inside the feature but significantly higher on the margins or at the interface of abandoned channels and other features.

identified for influencing the placement of maintenance sites are expected to be present in or along abandoned channels unless associated with the former active period of the stream channel.

Abandoned channels could be expected to attract aboriginal groups for the purpose of resource extraction from the time of their initial formation until they were completely filled. Archeological sites related to the extraction of such resources could be expected on the perimeter of the channel or on other kinds of deposits adjacent to these features. Archeological deposits within the channel would not be possible until the feature was filled completely by later depositional activities. Site densities are expected to be low on or within abandoned channel deposits. They may be higher, however, on the interface between abandoned channels and the other kinds of deposits identified above. All of these sites are expected to be resource extraction loci.

Abandoned courses represent the last channel occupied by a stream prior to its abandonment of a meander belt. Deposits within such features will grade from fine clays and silts to coarse sands and gravels with depth. The coarse materials are deposited during the active phase of the course while the finer materials represent later deposition or post-abandonment alluviation. When active, these features would provide access to aquatic food resources in relatively deep water with some current. These would include fish, reptiles, and shellfish. The higher natural levees along the stream course would provide access to terrestrial food resources, both riparian (e.g., small mammals or amphibians) and non-riparian (e.g., acorns, berries, deer, hickory nuts, etc.). Migratory waterfowl would be expected during portions of the year as well. Raw materials would include fur-bearing mammals and floral products (e.g., woods for toolhafts, materials for basketry, etc.). Natural levee deposits along courses would have provided excellent locations for maintenance sites within the greater floodplain due to their proximity to these resources and the presence of most of the logistical attributes which are favorable for the placement of these loci. These attributes include access to the watercourses for potable water and as a route for transportation, relatively drier soils, and relatively higher elevations. This elevation would prevent the inundation of activity loci except during periods of extreme high water. One previous statistical assessment (Gibson 1975a) of site location supports this predilection by human groups for the placement of activity loci on the natural levees of stream courses in the region containing the project area. This assessment is limited, however, due to its utilization of a biased sample (see Chapter V). Hemmings (1981:277) observed a similar selective process for resource extraction sites in the Grand Marais Lowland. Weinstein and Kelley (1984:509-510) note the same orientation for Coles

Creek villages and hamlets in the Felsenthal region of the Ouachita Valley.

If the course remained in an inactive portion of the floodplain, a situation similar to an abandoned channel could be expected to develop (i.e., the seasonal replacement of aquatic resources) with a concomitant attraction for human utilization. If reoccupied by another active stream, the course could be expected to retain most of the original attributes related to its human utilization. Therefore, one would expect sites to be located along the natural levees of a course which related to its last active period, sites which represent human activities related to its later abandoned phase, and sites related to the utilization of streams which may have reoccupied the abandoned course. Sites related to earlier active periods of the original parent stream may be present; however, their destruction by the constant meandering of the parent stream is highly probable.

Even after the course had been abandoned and filled, the levee areas may retain some of their relative elevation which provided an attraction for the earlier location of human activities. These elevated areas should represent some of the driest portions of the floodplain. Such relatively dry areas would not only attract human settlement but would provide better habitat for hardwoods, such as oak and hickory, which provide food in the form of acorns and nuts for humans and white-tailed deer. Sites related to the aboriginal exploitation of these resources could be expected in such drier areas. Therefore, one may expect sites on such deposits or features which do not relate to the acquisition of aquatic or riparian resources or access to transportation routes but to the later extraction of terrestrial resources.

Given the above possibilities for aboriginal human occupation of areas identified as abandoned courses, this stratum is expected to display the highest density of prehistoric sites among the four geomorphological strata. These sites will include both maintenance and extraction loci. Greater proportions of these sites should represent maintenance loci as opposed to extraction loci than in any of the other strata. Given the expected diversity of available resources and the continued presence of multiple resources over long periods of time, the greatest diversity of sites with regard to temporal and functional association should be present within this stratum as well.

Point bar deposits represent materials left by the parent stream during its meandering within a particular meander belt. These deposits may be quite coarse and are often well-drained (Saucier 1974:10). They may also be topped by a thin veneer of natural levee deposits. These areas would have provided aboriginal human groups access to terrestrial resources (foodstuffs and raw materials) similar to those noted for abandoned courses. Such sites would most often be coeval or later than the last course of the meander belt as earlier sites may have been redeposited or destroyed by the reworking of point bar deposits by the parent stream during its active occupation of the meander belt. Site densities can be expected to approximate those along abandoned courses given the similar nature of the materials composing both strata. The proximity tc additional kinds of resources (e.g., active streams, oxbow lakes, etc.) would influence whether expected site densities for the point bar stratum could equal those expected for abandoned courses. The majority of these sites should represent resource extraction loci. The presence of well-drained soils in the levee deposits, however, would provide some attraction for the establishment of maintenance sites.

Backswamp areas represent the flood plains of the meander belts which create the other three kinds of deposits used to stratify the study area. Backswamps receive clays and silts during periods of overbank flooding. Some portions are expected to be permanently inundated while others may be quite dry. These areas would provide food resources and raw materials varying from riparian to aquatic to terrestrial dependent on their local elevation, local drainage, and the proximity to lakes, ponds, or watercourses. Sites related to the extraction of these resources could be expected wherever local conditions were favorable for their development. Areas close to abandoned channels or other permanent ponds or marshes would be likely areas for the placement of sites related to the extraction of aquatic or riparian food resources or raw materials. Sites related to the extraction of terrestrial food resources or raw materials would be expected in areas with better drained and drier soils. Site densities are expected to vary depending upon extremely local conditions which are difficult to control or predict without detailed assessments of the entire backswamp. Overall, site densities within the backswamp are expected to be lower than those expected for abandoned courses or point bars due to the less predictable nature of the backswamp and its greater areal extent as compared to the other three strata. Most of these sites should represent resource extraction loci.

Summary

Four geomorphological strata are expected to provide varying densities and kinds of sites (i.e., extraction or maintenance) related to the particular attributes each possessed concerning the nature of exploitable resources within a stratum. Abandoned channels are expected to contain few sites. They may be associated with numerous extraction sites along their peripheries. Abandoned courses are expected to possess the highest densities of archeological sites and the greatest diversity of sites due to their multiple attributes related to resource extraction and access. Both maintenance and resource extraction sites are expected to occur in high frequencies. Point bar deposits are expected to have densities similar to, but less than, those observed for abandoned courses. While most sites within the point bar stratum are expected to relate to resource extraction, some maintenance loci may occur if local conditions are suitable. Backswamp areas are expected to display overall low site densities. Extraction sites may be clustered around local features which provide access to various resources. This may produce higher site densities in small areas of the backswamp. The location of such areas will be hard to predict, however, without intensive and extensive documentation of the distribution of these local conditions.

CHAPTER IV

THE HISTORIC SETTING

An Historic Overview of St. Landry Parish

The majority of the Bayou Cocodrie and Tributaries Project area lies within St. Landry Parish. This parish has a long and varied history which encapsulates and reflects the colonization of North America, and particularly Louisiana, by European settlers. The background contained herein is intended as a brief overview. A more complete synopsis may be found in Goodwin et al. (1986).

The earliest European contacts in what was then known as the Opelousas District were represented by French trading posts. Traders handled reciprocal exchanges between the indigenous Opelousas Indians and merchants in New Orleans. During this period (ca. 1690 to 1760), European occupants of the area remained few.

A major influx of French settlers arrived between 1764 and 1770. Most of these settlers were refugees from those portions of eastern Louisiana which were ceded to Great Britain following the Seven Years War. In addition, a few Acadian families settled in the Opelousas District in 1768.

French colonial control of Louisiana ended in 1769, when the territory came under Spanish control as result of secret treaties between the aforementioned governments prior to the end of the Seven Years War. The Spanish governor prevented further Acadian settlement in the district after this date.

Beginning in the 1770s, Anglos from the English colonies began to settle in the Opelousas District, and the Spanish Colonial government made free land available to them. Many of these settlers were English Loyalists (DeVille 1973:37). Others, such as a group of sixty Irish and German Catholic refugees from Fort Pitt (Pittsburgh), were seeking religious freedom. This group, which arrived in the Opelousas District in 1780, received food, clothing, and supplies, in addition to land (Conrad 1977:137). The Anglo settlers had a substantial impact on population growth in the Opelousas District; by 1785, there were 1211 people in the district, an increase of over 1000 in fifteen years.

By the end of the eighteenth century, Free People of Color were an important group in the Opelousas District. Many were former slaves freed by their masters. The gens de couleur, of whom a significant number became affluent, had considerably more freedom during the colonial period than they later did under

American rule. By 1792, twenty-six free Black men lived at the Opelousas Post (DeVille 1973:38-39).

During this period of population expansion, economic emphasis shifted from trade to agriculture. Cattle, tobacco, and indigo represented the primary products of such pursuits. By 1800, cotton had become the most important cash crop in the area. Despite this, cattle ranching and horse breeding remained important activities on the prairie throughout the antebellum period. Cash crops were primarily cultivated along the bayous. Darby noted that:

> ... the relative pursuits of the inhabitants of Opelousas will no doubt preserve their present form. Those near, or on the alluvion and adjacent parts will continue to cultivate the soil, that is not in many other places either equalled or excelled, whilst in the distant prairies and pine forests, the sterile soil will compel the retention of cattle as support and staple.... The staples of Opelousas at this time are cotton, cattle, hides, tallow, cheese, beef, and pork. It has been disputed which of the two former yields (cotton or cattle) yields the highest revenue on the same labor and capital (Darby 1816:207).

Because the Opelousas Post was not located on a waterway, cattle and agricultural products were shipped from the settlement of Church Landing on Bayou Courtableau. The advent of steamboats in the early nineteenth century greatly reduced the time required for travel to New Orleans from Church Landing. This technological advance contributed to the growth of the small port. In 1835, three years after the arrival of the first steamboat at Church Landing, the thriving port was incorporated as the town of Washington, which soon became the largest port in southwestern Louisiana. Large warehouses for incoming and outgoing goods were built within the town at the landings along the bayou, and a market place for the vending of foodstuffs was established (Wenger 1974:29). Steamboats traveled up Bayou Courtableau as far as the junction of Bayous Cocodrie and Boeuf, where their goods were transferred to barges which were towed further up the bayous (Fontenot 1955:40). Similarly, outgoing cargo was either towed down the bayou to the port, or carried overland by wagon to Washington. Cattle, hides, cotton, sugar, molasses, and lumber were the principal exports.

Although navigable waterways were the economic and commercial foci of St. Landry Parish, settlement was not restricted to the natural levees along their banks because there was ample high land available in other locations for settlement, animal husbandry, and for agriculture. Dwellings generally were located on the highest land (Post 1962:74). In fact, settlement was denser along the land-locked ridges than along the low lying land on Bayou Courtableau between Bayou Carron and Port Barre, which was occupied by only small farms (Bob Bailey, personal communication 1985). Opelousas, the major population center, was inland from all navigable streams; also, many large estates were not located along major watercourses. Even on many estates with bayou or river frontage, great houses were set back relatively far from the waterway. Furthermore, a significant number of small farms existed in St. Landry Parish during the nineteenth century, contributing to a very different settlement pattern than that typical of southeastern Louisiana during the antebellum period.

Because both stock raising and cotton cultivation were profitable, there was no economic imperative to encourage sugar cane cultivation in St. Landry Parish. The capital outlays to outfit a sugar plantation were much greater than those required for a cotton plantation. Because of the relatively lower expense of cotton production, slaveless, yeoman farmers, as well as large planters, could cultivate it profitably (Taylor 1976:65). The large investment necessary for sugar production was prohibitive for small farmers, most of whom continued to cultivate cotton and raise some livestock (Post 1962:46, 72). Nevertheless, the nine per cent return on investment in sugar production, compared to the seven per cent return on investment in a cotton plantation of 1500 acres (Taylor 1976:67), was a sufficient incentive for large landholders to adopt cane cultivation. This shift in agricultural orientation occurred somewhat later, during the 1810s (Post 1962:72), along Bayou Courtableau than in southeastern Louisiana.

The region as a whole, however, was never dominated by plantations and monocrop agriculture (McTigue 1975:134). Because cotton could be cultivated on a small scale, small farms coexisted with large plantations during the antebellum period; the smaller farms were located on the poorest land. These yeoman farmers owned few slaves, and most of them did not own cotton gins.

The Civil War had a devastating effect on Louisiana's economy, and the Federal blockade of the Gulf Coast in 1861 completely disrupted the shipping industry. When Federal occupation forces entered New Orleans in May, 1862, the state capitol was moved to Opelousas. Less than a year later, on April 20, 1863, Union forces under General Nathaniel Banks entered and occupied Opelousas. The cavalry, a section of the artillery, and the 73rd Connecticut regiment were sent into Washington (Winters 1963:233). Colonel Thomas E. Chickering of the 41st Regiment of Massachusetts Volunteers was appointed military governor of

Opelousas, after Banks was forced to return to New Orleans on April 25, 1863. Troops under Chickering's command were ordered to confiscate cotton, sugar, and other agricultural products, which they then shipped out of Washington and Barre's Landing. Such activities resulted in a skirmish between part of the Federal occupation forces in Opelousas and Confederate Louisiana and Texas units near the junctions of Bayous Cocodrie, Boeuf, and Courtableau on October 24, 1863 (Edmonds 1979:236-241). Union and Confederate troops also occupied Moundville Plantation on Bayou Courtableau, and they established camps during different periods on the bayou banks (Delery 1972:189, Irwin 1892:132).

Following the war, the recovery of the agricultural systems of production was hampered by the wartime loss of property and the end of the slave labor system. Plantation agriculture required a wholesale shift in managerial and spatial orientations to accomodate the changes in the labor force. Cotton production recovered more quickly than the sugar industry. Cotton production required less capital for equipment, and cotton could be grown successfully on a small scale. This enabled cotton planters to institute share cropping and tenancy on their plantations during the Reconstruction era. Share cropping, which was utilized more widely throughout the south, required the land owner to supply the cropper with all tools, equipment, and draft animals utilized in production, with half the cost of seed and fertilizer, and with housing. In return, the owner usually received one-half of the resulting crop. Tenants, however, supplied their own equipment and draft animals, and they paid for one-third of their seed and fertilizer costs. The tenant then paid one-third of the crop to the land owner as rent on the land and buildings he utilized. Because the tenant owned his draft animals, the landholder usually supplied a barn in addition to a residence. Cotton produced under share cropping and tenancy was ginned either at a gin maintained by the planter on his estate, or at a central gin located elsewhere. Both sharecropping and tenancy were adopted in the St. Landry Parish during the immediate postbellum period, and they remained the dominant agricultural labor forms until World War II.

Sharecropping and tenancy changed the spatial organization of plantations in the St. Landry Parish. During the antebellum period, slave cabins were located close to each other in a single complex. Because the hands farmed individual plots, the antebellum quarters area was abolished; individual cabins now were spread across the fields (Prunty 1955). Each hand lived near the piece of land that he worked; houses were small cabins and cottages, not unlike those formerly used in the quarters areas. Field hands were given a barn and a small lot for their animals. Most "hand" housing was torn down after the labor system was abandoned, because it was scattered throughout the fields (Jack

Wartelle, personal communication 1985).

Sugar agriculture was not amenable to share cropping or to tenancy, since cultivation on a small scale was not profitable. Therefore, cultivation was practiced in the same manner as during the antebellum period, except that wage labor was substituted for slave labor. However, the number of operating sugar houses in St. Landry Parish decreased dramatically after the War Between States. By 1870, there were forty-one mills in the parish; after this date, the number of sugar houses in St. Landry declined steadily until 1910. Only the best equipped sugar mills continued to operate; there were no horse powered mills in the parish after 1890.

The presence of many small farms in the parish also aided in the agricultural recovery following the Civil War. These farms did not require the "structural" changes of the larger plantations. Most of these establishments began producing the same items as before the war. By the early twentieth century, agricultural production of cotton had recovered throughout most of the parish, sugar production decreased due to a failure to adopt the "Central Factory System" (Bouchereau 1874; Goodwin et al. 1986:99-100) employed in other parts of Louisiana, and cattle again became a prominent agricultural product (Goodwin et al. 1986:100).

The shipping industry on Bayou Courtableau revived fairly rapidly during the Reconstruction period, thereby aiding the economic recovery of the region and bringing in needed capital. However, navigation on Bayou Courtableau continued to be difficult during periods of low water (Goodwin et al. 1986:101-109). These navigational difficulties coupled with the arrival of the Morgan Branch Railroad in late 1880, contributed to the decline of the shipping industry between 1880 and 1900 (Talbot 1977). The construction of additional railroads into the region during the early twentieth century resulted in the demise of the shipping industry (Goodwin et al. 1986:109).

The lumber industry became important during the early twentieth century, but it did not provide Washington with the level of revenue previously supplied by the shipping industry. Four members of the Thistlethwaite family, a father and his three sons, settled in Washington in 1904, and they established a sawmill in the town. At that time, lumber was plentiful and land was inexpensive; there also was a large demand for hardwoods for furniture and for automobiles. To their credit, the Thistlethwaites practiced selective cutting of their trees, improving the quality of the timber stand. In 1924, they established the Thistlethwaite Reserve, which was the first hardwood preserve in the United States (Paul Thistlethwaite, personal communication 1985).

A few plantations in the region experimented with rice cultivation in the early twentieth century. Rice cultivation requires intensive labor only for a couple of weeks each year, at planting and then again at harvest. Thus, plantation hands worked the rice fields during these periods, but throughout the remainder of the year they cultivated cotton on their plots (Buster Plattsmeir, personal communication 1985). However, rice cultivation was never as important in St. Landry Parish as it was farther to the west, in the vicinity of Crowley, Louisiana (Jack Wartelle, personal communication 1985).

During the late 1920s, sweet potatoes were introduced to the area. Sweet potatoes were adopted as a cash crop on many of the large estates, and the region soon became the largest sweet potato shipping area in the United States. St. Landry Parish was also the largest cotton producer in the state during the 1920s (Will Nicholson, personal communication 1985). However, the depression era was difficult for the landowners in the region. The level of crop production was only fair, and prices were very bad. Cotton sold for only five to six cents per pound, and thirty dollars per bale.

The post World War II period brought a labor shortage surpassing that caused by the Civil War. Cane syrup mills depended on field hand labor for their operation. The labor shortages forced them to close down, and by the 1950s cane cultivation had been abandoned, as well (Jack Wartelle, personal communication 1985; Will Nicholson, personal communication 1985; Paul Thistlethwaite, personal communication 1985). Many landowners continued to invest in agricultural machinery in effort to increase profits and to overcome an increasing shortage of farm labor (Daniel 1981:247, 1984:430; Kirby 1983:270). Mechanization, which represented a trend throughout the early twentieth century, increased the amount of land that could be worked, and thereby increased potential yields for those who could afford the investment. This trend was evidenced by the introduction of mechanical cotton pickers into St. Landry Parish in the 1960s. Unfortunately, the machines resulted in a significant reduction of the per acre crop yield, and gradually cotton agriculture was abandoned. Today, the vast majority of the area is planted in soybeans and corn.

In summary, St. Landry Parish was distinctive in terms of its settlement pattern, its land use pattern, and its ethnic composition. The pattern of linear plantation settlement along natural levees of watercourses that was typical of southeastern Louisiana apparently never developed in St. Landry Parish. This appears to be the effect of the presence of more extensive tracts of relatively high and dry land away from the major bayous than in other portions of southern Louisiana. Plantation agriculture and monocrop cultivation never dominated the economics of the region as it did in most of Louisiana. A variety of ethnic groups, including Anglo-Americans, Germans, and Free People of Color, settled throughout the project area. Land use and settlement patterns were drastically affected by the changes in labor organization and agricultural orientation which resulted after the conclusion of the War Between the States and as a result of changing economic factors during the latter part of the nineteenth century and the early part of the twentieth century.

Historic Themes Relevant to the Project Area

Goodwin et al. (1986:126-137) developed four major themes significant in the history and development of the Bayou Courtableau area. These are: the military occupation of the region during the Civil War, the ethnic diversity of St. Landry Parish, the settlement and land use pattern of historic southwest Louisiana, and the growth of the port of Washington. Since the Bayou Cocodrie and Tributaries Project area lies within the same general region, these themes are applicable to research conducted in this study. The nature of the investigations (i.e., a stratified random sample survey of the wooded portions of the three reaches within the project area), however, limits the applicability of all four of the abovementioned themes. Therefore, two of these themes, the explication of settlement and land use patterns in historic southwest Louisiana and the ethnic diversity of St. Landry Parish, can be addressed during this study.

This study provided an opportunity to document further the land use and settlement patterns in the region. Some of the attributes and resources identified for each of the strata described in Chapters II and III could have been utilized by historic period peoples as well as prehistoric ones. As such, the distributions of historic sites with respect to landform would provide more comprehensive information concerning land use and settlement patterns within the project area.

In addition, the relationship of historic sites representing particular temporal periods (e.g., antebellum, postbellum, twentieth century) to the reaches or geomorphic strata described in Chapters II and III could help to demonstrate the changes in land use and settlement pattern which occurred throughout the region. Such a research effort would require temporally distinct sites representing similar functions (i.e., homesites, storage sites, barns, etc.) which could be compared as to their locations or orientations with respect to the geomorphic strata.

Artifact assemblages would be compared to determine whether differences between the artifacts representing distinct ethnic groups exist. These investigations would require the association of discovered sites and their associated assemblages with particular ethnic groups. The inability of previous researchers (e.g., Goodwin et al. 1986) to define these relationships between assemblages and ethnic communities, however, suggested that this line of enquiry would be limited to sites with the excellent historical documentation necessary to associate artifacts and their locations with ethnic communities.

Expectations Concerning Historic Sites in the Project Area

Two predictions concerning the nature of historic sites likely to be discovered during the stratified random sample survey of the Bayou Cocodrie and Tributaries Project area can be made given the above discussions. First, most of the sites discovered will represent agricultural activities (e.g., farmsteads, barns, agri-related refuse dumps). This prediction is based on the length of agricultural utilization of the region and the focus of this study on the wooded portions of the project area. These wooded areas are generally located away from the present centers of population (i.e., the town of Washington or along the major thoroughfares) and, with the exception of portions of Reach K along Bayou Cocodrie, away from the major bayous in the project area. Also, most of these agriculturally oriented sites are expected to represent smaller, less affluent landholdings or farming operations given the orientation described above of the larger landholdings in the region towards upland areas.

Second, historic site location is not expected to correlate with the geomorphic strata discussed in Chapters II and III in the same manner as prehistoric sites. Rather, historic site location, particularly for sites associated with agricultural activities, will be dependent on access to tillable lands and access to markets for agricultural products. Some factors which influenced prehistoric occupation at a particular locale also would be operative during the historic period (e.g., historic resource extraction sites, such as hunting or fishing locales, could be expected to occur at locales similar to prehistoric sites of similar function). A greater diversity of logistical attributes during the historic period could cause variations in the location of historic homesites, which would be roughly equivalent to prehistoric maintenance sites. The availability of land at the time of initial occupation of a site, the relationship of site locations to the contemporary transportation network, the nature of the agricultural products from a site, and relative economic status of the occupants would represent some of the factors which influenced the location of large or small historic farmsteads. These economic factors are quite different from the more ecological logistical concerns predicted to influence the location of prehistoric maintenance sites. Therefore, the modeling of historic site types or locations with respect to the geomorphic strata defined above is not appropriate.

In summary, historic sites discovered during this survey were expected to represent sites of various functions related to small, agricultural operations. Given the greater variety of factors which could influence historic site location, the locations of these sites was not predictable using the geomorphic stratification of the project area described in Chapters II and III. Descriptions of patterns of historic land use and settlement, changes in these patterns, and possible ethnic diversity represented in archeological assemblages may be augmented through the examination of the results of this survey.

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CHAPTER V

SAMPLING DESIGN AND METHODOLOGY

In an effort to characterize archeological resources within the three-year flowline, a stratified sampling design of the wooded portions of this area was developed. Probabilistic estimates of site density will permit predictive statements concerning the possible impacts to cultural resources in the area as a result, directly or indirectly, of the Bayou Cocodrie and Tributaries Project.

A Review of Previous Sampling Designs

Earlier archeological investigations in the region have attempted to associate various prehistoric sites with particular geomorphological features. Since these features relate to various episodes of deposition, archeological materials of contemporary or more recent occupations can be expected on features of a particular age. Another study attempted to associate a number of environmental variables to the location of sites. Three of these studies will be discussed below.

The first modern study within the region to develop a predictive model of site location was Gibson's (1975a) survey of Bayou Teche, the Vermilion River, and Freshwater Bayou to the south of present study area. Gibson (1975a:22-28) identified a number of environmental variables which he attempted to associate with the location of sites along these drainages. These variables included: landforms, bank position, stream confluences, relative elevation, soil types, and plant communities. Several value states were identified for each of these variables. The distribution of sites with respect to each environmental variable (with the exceptions of soil types and plant communities) were assessed using a Chi-squared test for random associations. Contingency tables were created which displayed the number of sites observed and expected per value state for each variable. Observed values represented the number of sites discovered by the survey and/or previously recorded within the project corridor. Expected values were calculated using the percentage area of a value state for a variable within the project corridor. Each of these tables was analyzed individually. The results of each analysis were interpreted separately as to the effect of each variable on site locations.

Deviations from expected random distributions of site frequency over the value states of a variable were assumed to represent the influence of human decision-making in the location of activity loci. That is, a value state which displayed site frequencies different from its expected number represented a selection or rejection of that particular environmental condition by prehistoric site occupants. Two implicit assumptions underlay this interpretation of non-random distributions. These were that site densities were the same for all possible value states of a variable, and that criteria for the selection of site locations were the same for all temporal periods. Given that there was little previous data to guide Gibson's (1975a) analysis and that site frequencies per separate temporal periods were low, these assumptions were not invalid. No discussion of the possible effects of these assumptions on the results of the analyses was presented, however. Acceptance of the interpretations drawn from these analyses should be tempered with the possibility that the results may be an effect of one or both of these assumptions and not solely an artifact of human decision-making.

Gibson (1975a:89-90) attempted a multivariate approach employing all of his variables through a discriminant analysis. He briefly discussed the results of this analysis but presented none of the particular criteria employed during the process. Lack of this information precludes any discussion of these results.

Gibson (1975a:92-93) also employed a spatial assessment of the distribution of sites along the stream courses. In this assessment, the distribution of points along a line is tested for randomness (after King 1969). Using only sites associated with Tchefuncte period materials, Gibson (1975a:92) found that there was not a random distribution of sites along the Vermilion River. Interpretations of this non-random distribution were tentative due to the lack of sufficient data points in the analysis (thirteen instead of twenty-four) and the unknown effect to the assessment created by the violation of this assumption.

Despite these critical statements, Gibson (1975a) did provide the first serious attempt at settlement analysis for this portion of Louisiana. A larger data base and more sophisticated applications of statistical and/or spatial analyses are in order to address the issue adequately. The results of Gibson's (1975a) assessments do provide testable hypotheses concerning site locations with respect to environmental factors for subsequent investigations within the region.

Gagliano et al. (1978) developed an extensive depositional history of the region around the Teche-Vermilion Conveyance Channel. Using previous studies (such as Saucier 1974) and their own data, Gagliano et al. (1978) were able to identify the meander belts which cross the area between the Atchafalaya River and the town of Washington, Louisiana. These meander belts were identified as to the parent stream responsible for their formation and their approximate dates of deposition. The locations of archeological sites within the relevant areas of St. Landry, Avoyelles, and Evangeline Parishes were plotted on their maps of geomorphological features or deposits. The initial occupations of these sites were correlated subsequently with the temporal span of the depositional episode responsible for the formation of their associated geomorphological features.

The authors summarized that there appeared to be a positive association between the initial occupation of a site and the active period of deposition for a particular geomorphological feature (Gagliano et al. 1978:67). There were problems, however, as some deposits contained materials associated with later phases. Gagliano et al. (1978:65-67) suggested that these streams remained active watercourses after the abandonment of the meander belt by the parent stream. Implicit in this suggestion was the assumption that site locations were related to active streams within the floodplain. As stated in Chapter III, other factors may be responsible for the selection of these areas as human activity loci. In addition, many of the known sites with identifiable components were not employed in the associations or not discussed in the presentation of the these associations. Despite these weaknesses, the relationships defined by Gagliano et al. (1978) appeared to be valid and were employed in subsequent studies (e.g., Goodwin et al. 1986).

Following suggestions by Neitzel and Perry (1977), Saucier (1974), Webb (1970), and Gibson (1975a, 1978), Goodwin et al. (1986) developed a predictive model for the definition of areas with high probabilities for the location of prehistoric sites along Bayou Courtableau. In addition, these areas were related to specific depositional episodes permitting the temporal associations described above. Due to Gibson's (1975a) suggestions concerning stream confluences and site location and the location of the four known prehistoric sites in the project area, past and present stream confluences were identified as the likely locations for prehistoric sites. Only two of the sites discovered during this survey occurred at these locations. This prompted the authors to conclude that the stream confluence model of site location was more appropriate for streams which are larger than Bayou Courtableau and/or that other factors may contribute more to the selection of prehistoric site locations below a certain threshold of stream size. In addition, there appeared to be some correlation between the relative age of sites and the relative age of the geomorphic deposits on which such sites occurred (Goodwin et al. 1986:299-301).

Despite the inconclusive results from previous studies, geomorphological features similar to those employed by Gagliano et al. (1978) and Goodwin et al. (1986) have been employed to stratify the study area within each reach. These features represent four distinct depositional environments deriving from previous fluvial activity within the study area. As noted in Chapter II, these four types of deposits are: abandoned courses, abandoned channels, point bars, and backswamps. While other criteria might be employed (e.g., soil type, elevation, etc.), the selected features have the benefits of being recognizable on maps of the study area, and of presenting strata of sufficient size for meaningful sample survey. In addition, the differences between Mississippi and Red River deposits are observable in the field. These conditions represent logistical necessities to the operationalization of a sampling strategy. As noted in Chapters I and III, these features are assumed to have influenced human utilization of the study areas.

These four strata can be assigned to temporal phases of deposition, as well. Such relationships permit discussion of settlement patterning by particular prehistoric groups within the study area. As such, the four depositional environments provide a sound theoretical basis and a logistically feasible approach for stratifying the area.

Weaknesses in this stratification are two-fold. The low total area of two of the geomorphological strata, namely abandoned courses and abandoned channels, present problems with respect to probabilistic statements concerning site densities and distributions. Therefore, the sampling strategy has been weighted to permit greater coverage of these areas than would be the case applying simple stratified random sampling. This strategy is outlined below.

The second factor concerns the unknown correlation between the selected geomorphic features and past human activities. Previous research permits a tentative acceptance of the stratification. Previous research has not provided, however, a valid assessment of the assumed relationships. Both the Gagliano et al. (1978) and Goodwin et al. (1986) studies focused on discontinuous corridors that in general were surveyed parallel to contemporary stream courses. This study effort should provide a more valid assessment of the relationship between landforms and human activity in the region due to its more representative coverage.

Sampling Strategy

The survey was designed to examine five percent (approximately 588 acres or 238 hectares) of the total wooded area within the three-year flowline of Reaches K, L, and M of Bayou Cocodrie and its tributaries. This area represented the sampling universe. This universe was expected to contain archeological resources which have not been impacted by previous episodes of land clearance and agricultural activity. From the sample, a characterization of the resource base within the three-year flowline which may be impacted by future land clearance and subsequent agricultural activity was developed.

The present study employs a two-stage stratification of the Bayou Cocodrie and Tributaries Project area. The initial tripartite and a priori stratification is by reach (K, L, M). Woodlands within the three year flowline within each reach represent discrete sampling universes. Within each reach, the woodlands are classified on the basis of the predominant geomorphological feature present, e.g., abandoned course, abandoned channel, point bar, and backswamp. This provides the second stage of stratification.

This study sampled five per cent (588 acres or 238 hectares) of all the woodlands within the three-year flowline. As indicated above, the sampling fraction by reach was adjusted to permit adequate representation of each geomorphologically-defined stratum. A weighting of the geomorphological strata with respect to total area provided the basis for these adjustments. A description of the process for identifying these strata within the reaches and calculating their areas follows.

All data concerning the project boundaries, such as the three-year flowline and the distribution of the various fluvial deposits, were plotted on USGS 7.5 minute series topographic maps. A 500 by 500 meter grid, based on the 10,000 meter UTM grid system, was superimposed on the maps. The quadrats resulting from this grid were employed to locate the sample units which were examined within each reach (viz. Goodwin 1979). Figure 4 displays the quadrats created for Reach K for the location of sample units. Figure 5 displays these quadrats over Reaches L and M.

Each quadrat was visually assessed as to the predominant geomorphological feature present within it. This assessment permitted the assignment of quadrats to a stratum. Quadrats with sufficient wooded areas for survey in two geomorphological strata were assigned to both.

From the maps, the total area of woodlands by stratum and reach was estimated by using the planimeter, and the total number of wooded quadrats within each stratum and reach was counted. Due to the low total area of three of the geomorphological strata (abandoned channel, abandoned course, and point bar), two sizes of sample units were employed. A survey transect of 40 meters by 500 meters was employed in quadrats identified as point bar, abandoned

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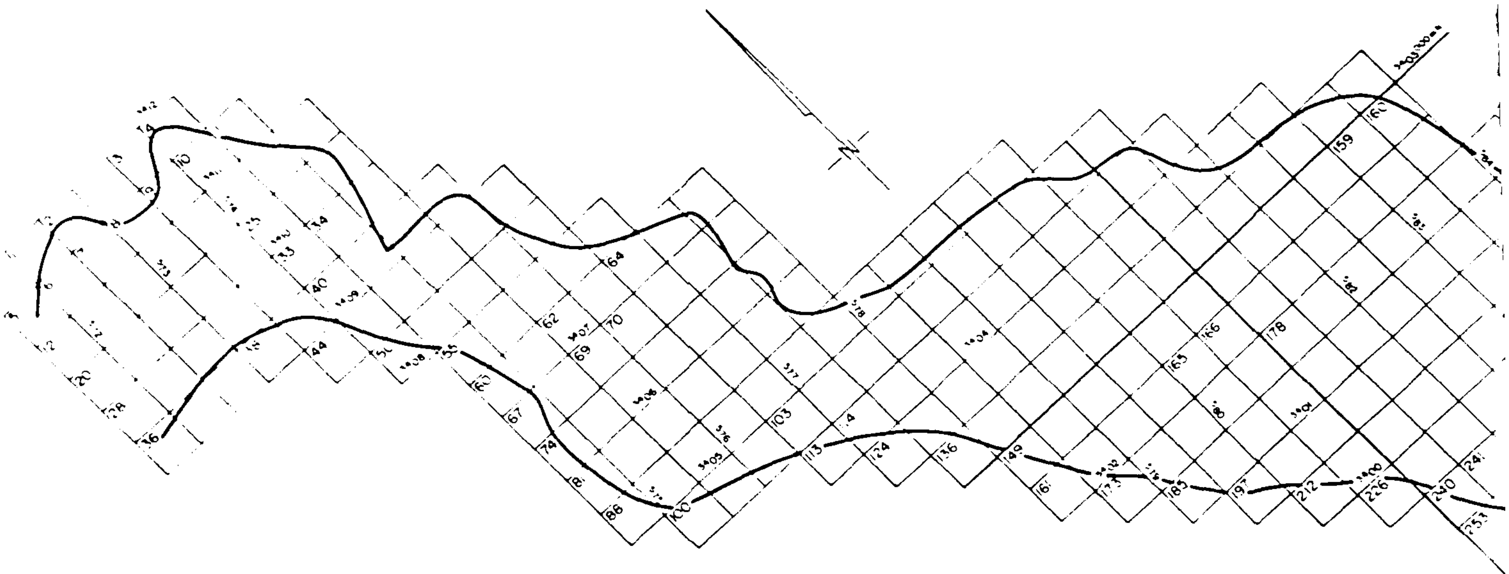
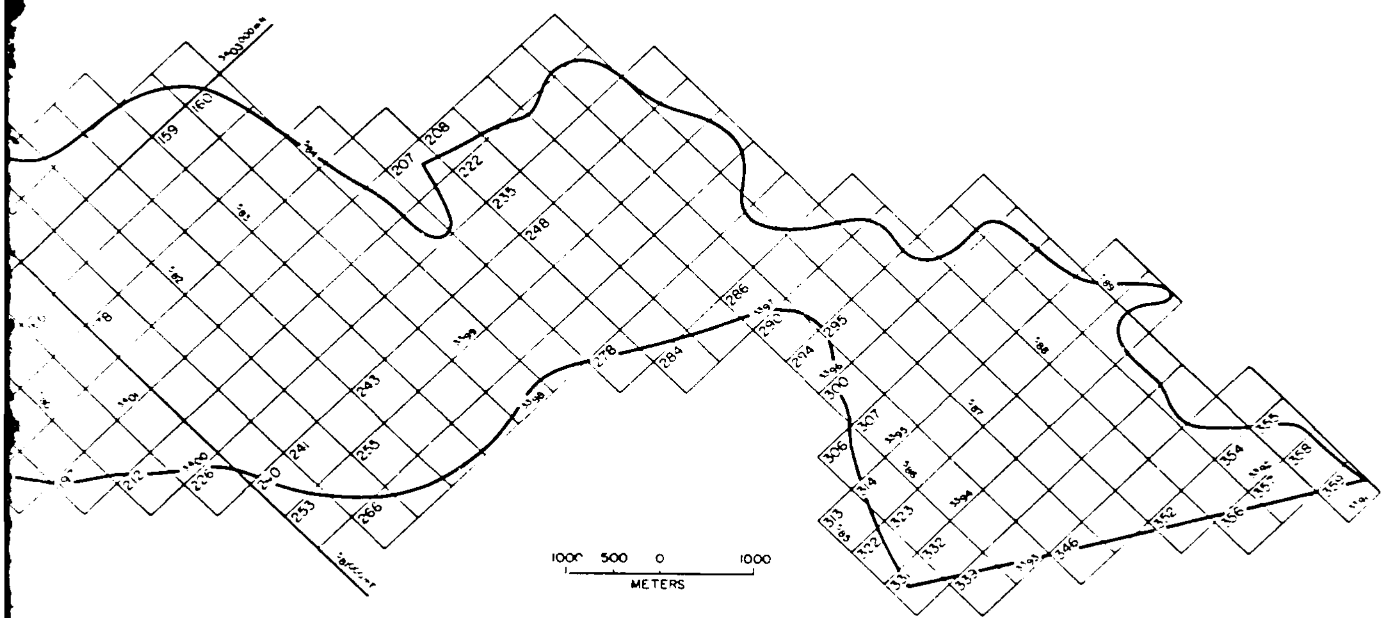


Figure 4. The grid of 500 m x 500 m quadrats
sample units over Reach K.



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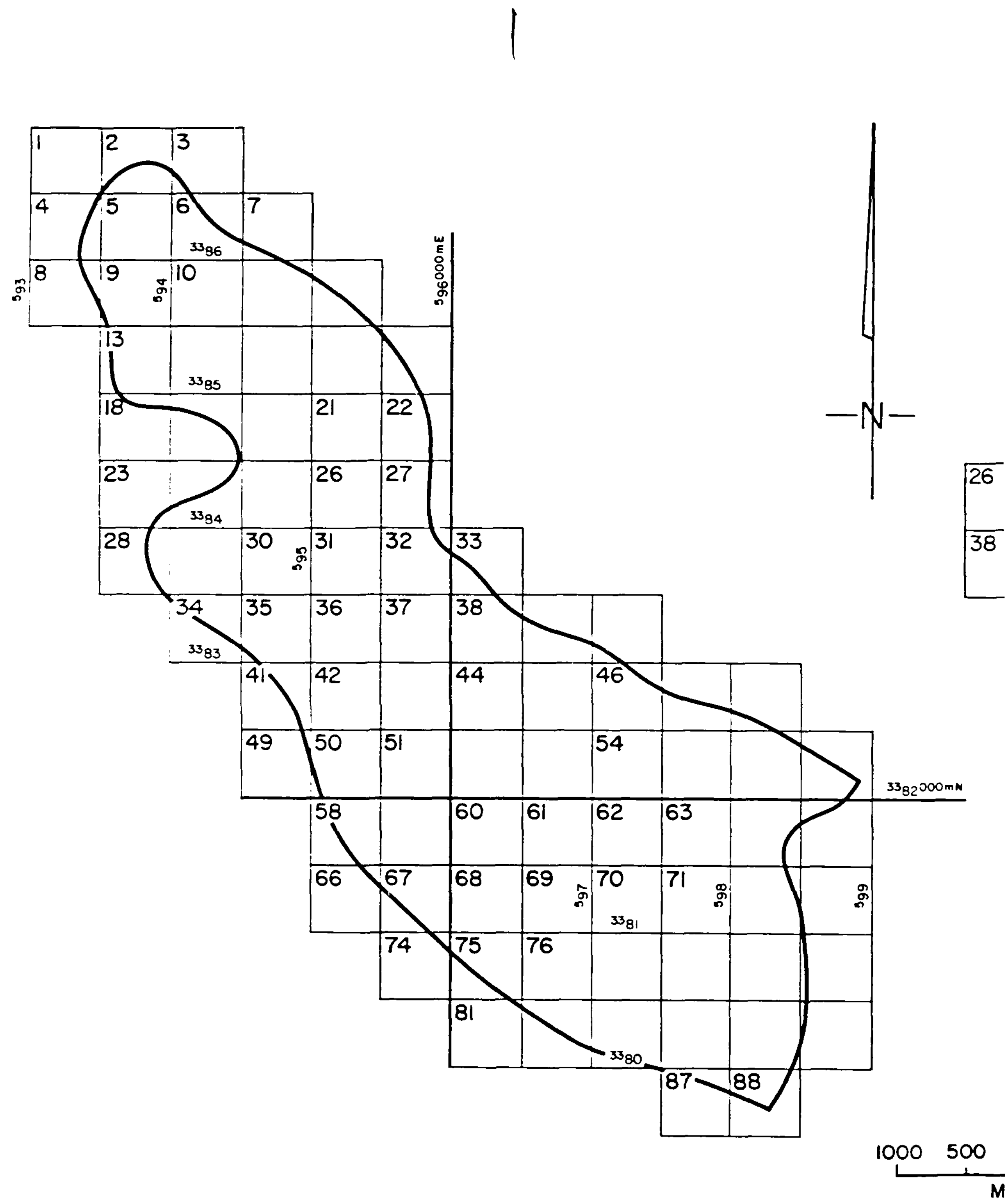

Figure 5. The grid of 500 ~
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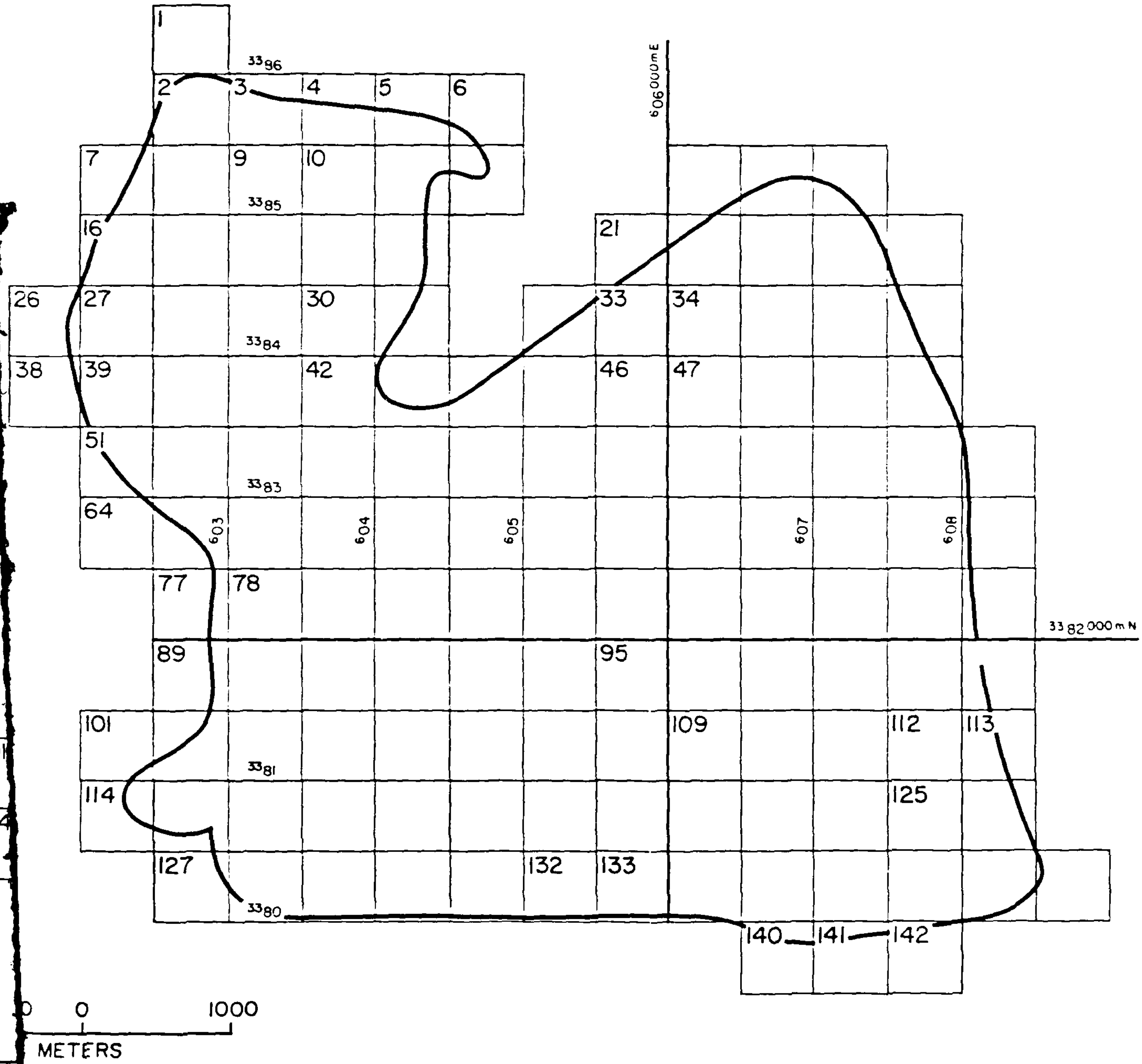

[illegible] m quadrats employed to locate
ver Reaches [illegible] and M.

course, or abandoned channel. Each transect comprised two hectares of examined surface, and twelve shovel tests. Transects within the backswamp stratum were 80 meters by 500 meters in size. Each comprised four hectares of examined surface and 24 shovel tests.

The use of two sizes of sample units permitted the dispersal of the sampling fraction within each of the smaller strata over the project area. Originally, a standard sample unit of four hectares (an 80 meter by 500 meter transect) was to be employed. The lack of sufficient contiguous wooded areas within most of the quadrats identified as abandoned channel, abandoned course, or point bar would have produced small numbers of sample units within these strata (e.g., one transect for abandoned channel stratum). Such a strategy would not provide an adequate representation of the smaller strata due to the limited number of locations of sample units (i.e., one location) within the stratum. The use of smaller sample units increased the sample sizes within these strata since smaller woodlots (i.e., with less than four hectares of contiguous woodland) could be included in the sampling universe. This increase and the dispersal of the sample over a greater portion of these strata provided a more representative sample than would have been possible under the original sampling design (Plog 1976:151).

The areas of woodland within each geomorphological stratum by reach are shown in Table 6. The wooded area of each of the geomorphological strata provides a basis for weighting the selection of sample units from each. The absolute ratio between these areas in terms of hectares is 7.5:12.5:69.5:4524; the relative ratio of wooded land is 1:2:9:603, for abandoned course, abandoned channel, point bar, and backswamp, respectively. However, and as noted above, survey and field sampling require sufficient concentrations of wooded land to contain a sample unit. For that reason, ratios were recalculated using sampling quadrats that contained two or more hectares of contiguous woodlands.

The total number of wooded survey quadrats within each reach is shown in Table 7. The absolute ratio of sample quadrats by strata is 8:10:54:244; the relative ratio of wooded quadrats by reach is 1:1:7:31, for abandoned course, abandoned channel, point bar, and backswamp, respectively.

Due to the low total area of the abandoned course and abandoned channel strata at large and within each reach, examinations of sample units in all quadrats which contained a minimum of two hectares of contiguous woodland within these strata were planned. The number of surveyable quadrats in these two strata provided the basis for calculating the number of quadrats that would be surveyed in the other strata. Thus, twenty-seven point bar quadrats were to be surveyed. Forty-five quadrats,

Table 6. Wooded Area of Each Reach by Geomorphic Strata (in Hectares).

REACH	K	L	M	TOTAL
Stratum				
Abandoned Channel	110	15	0	125
Abandoned Course	0	30	45	75
Point Bar	0	290	405	695
Backswamp	3654	279	157	4090
Total	3764	614	607	4985

Table 7. Total Number of Surveyable 0.5 km^2 Quadrats in Each Geomorphic Stratum.

REACH	K	L	M	Total
<u>STRATUM</u>				
Abandoned Channel	10	0	0	10
Abandoned Course	0	5	3	8
Point Bar	0	26	28	54
Backswamp	221	14	9	244
Total	231	45	40	316

then, were to be examined in the abandoned course, abandoned channel, and point bar strata. These sample units would contain 90 hectares of woodland. An additional 37 quadrats from the backswamp were to be examined to obtain a five per cent sample (238 hectares) of all woodlands in the project area, as required in the scope of work for this project. In total, 82 sample units were to be examined.

If the total area to be examined within each stratum is compared, the ratio approximates the relative ratio of wooded land by stratum defined above. The absolute ratio of area to be surveyed (in hectares) is 16:20:54:148; the relative ratio is 1:1:3:9 for abandoned course, abandoned channel, point bar, and backswamp respectively. While the exact figures are not the same, the relative relationships between the total area within the strata are maintained. That is, approximately equal areas within the abandoned course and abandoned channel strata were selected for examination; a greater amount of the point bar stratum was selected when compared to the previous two strata; and a significantly greater amount of the backswamp stratum was selected when compared to the other three strata.

The distribution of these sample units over the three reaches is weighted to approximate the relative relationship between them with respect to total wooded area within the three-year flowline. Where possible, relatively equal representation by geomorphic stratum has been maintained within each reach. Reach K, however, contained no abandoned course or point bar deposits; Reach M contains no abandoned channel. As a result, and in order to maintain the weighting previously described, sample units were placed in all of the quadrats which contained at least two hectares of contiguous woodland within the abandoned channel stratum in Reach K, and within the abandoned course stratum in Reaches L and M. This resulted in the number of sample units per reach per geomorphological stratum displayed in Table 8. The sampling fractions are displayed in Table 8, as well.

As noted previously, the actual random selection of quadrats involved only those locales with sufficient woodlands to contain a sampling unit. Quadrats were randomly selected within the geomorphic stratum within a reach. Multiple selection of a quadrat, e.g., sampling with replacement, was permitted. The actual locations of sample units selected for examination will be presented in Chapter VI.

Once selected, quadrats were employed to locate the sample units. Ideally, the origin of a transect was placed at the center of the quadrat. Transect orientations were selected randomly at 30° increments from 0° to 330°. In the ideal situation, the objectivity of survey results would be increased by this

Table 8. Hectares to be Surveyed per Geomorphic Stratum by Reach from Planimeter Estimates.

REACH / STRATUM	K	L	M	Total	Per cent Coverage by Stratum
Abandoned Channel	20	0	0	20	16.0%
Abandoned Course	0	10	6	16	21.3%
Point Bar	0	16	38	54	7.8%
Backswamp	80	32	36	148	3.6%
Total	100	58	80	238	4.8%
Per cent Coverage by Reach	2.7%	9.4%	13.2%	4.8%	

approximation of a double blind approach (after Goodwin 1979). The random selection of transect orientations within each quadrat was expected to prevent the duplicate coverage of an area if a quadrat was selected more than once. If this could not be prevented, an additional quadrat would be selected and examined. Fortunately, this situation did not arise during the selection of sample units.

When the ideal situation described above was not encountered, transects were aligned to provide sufficient coverage within the selected quadrat, geomorphological feature, and/or the project boundary (the three-year flowline). This permitted the orientation or relocation of transects away from areas with extremely low probabilities for site discovery. These included areas that were underwater (e.g., southeast corner of Reach L) or were covered with recent spoil (e.g., directly parallel and adjacent to the Bayous Boeuf-Cocodrie Diversion Channel). Transects that crossed large unfordable streams, such as most of the larger bayous in the project area, were reoriented also to alleviate the logistical problems presented by such crossings. In these situations, the transect origins were placed at the corners of the quadrats or aligned to intersect the center point of the quadrat if local conditions permitted. Otherwise, the transect origins and orientations were selected to permit the examination of the necessary surface area within the parameters noted above.

While emphasis was placed on the wooded portions of the project area, transects which fell into areas that had been cleared since 1984 were surveyed. This logistical modification was necessary since areas which were wooded in 1983 may have been cleared in the intervening period. Besides obviating the deletion of cleared areas and the reselection of wooded sample unit locations, this procedure enabled the observation and collection of data on aspects of the effects of the clearance of woodlands on archeological resources.

Field Methodology

Each transect was examined by a two- or four-person crew. Crew members were spaced at 20-meter intervals. A regimen of one shovel test or auger test every 100 meters was employed as per the Scope of Services (Appendix I). Transects were numbered sequentially as they were examined. Scale diagrams were drawn of each transect while the examinations were in progress. Local features (such as treelines, fences, swamps, etc.) were indicated on these diagrams. Shovel test locations were recorded and numbered. Notes for each the transect and the shovel tests were recorded on the diagrams and transect record forms. Soil samples were recovered from one of the initial tests along each transect. Additional samples were collected whenever horizons or deposits which differed from those in the initial tests were encountered. All of these data were provenienced by reach, sample quadrat, transect, and shovel test.

In general, shovel tests were not dug in portions of transects which were inundated locally or under active cultivation (plowed and planted). Subsurface tests placed in inundated areas during the initial phases of the survey proved fruitless for the recognition of soils, soil horizons or features, or cultural material. Such areas were plotted on the diagrams of each transect and the untested locations noted as such. Subsurface tests were not placed in cultivated areas in an effort to reduce crop damage and to prevent friction between the landowners or lessees and the survey crew. Right of entry was granted most often under the condition that excavations not be placed in areas under active cultivation. Tests were placed in the margin of fields to provide an example of subsurface deposits. Further examinations were not made unless surface-occurring anomalies (e.g., artifact scatters or changes in soil colors or textures) were encountered. On three transects, auger tests were placed in cultivated fields to ensure that subsurface materials were the same as those visible at the ground surface and to search for possibly buried cultural material.

If access to the location of a randomly selected sample unit was impossible (either due to restrictions by landowners or local topography such as unfordable streams), these sample unit locations were replaced by the random selection of additional quadrats. The random orientations of transects were made prior to the field visitations to particular quadrats. A list of possible reorientations for each transect was selected randomly, through the consultation of a random numbers table, prior to arrival at a sample unit location to increase the efficiency of the field crews.

When sites were discovered, site boundaries were determined by systematic visual examination of the surrounding ground surface and systematic subsurface testing. Limited controlled surface collections were made at all sites. Three small sites (16SL91, 16SL92, 16SL93) were divided into quadrants (northeast, northwest, southwest, southeast). Each quadrant was examined separately by one crew member traversing the quadrant along transects at three meter intervals. With one exception (16SL93), all materials from each quadrant were combined due to the low total number of artifacts recovered. Three additional small sites (16SL89, 16SL90, 16SL93) were examined by transects oriented parallel to the longest axis of the site and spaced at five meter intervals. One large site (16SL94) was examined by crewmembers traversing one meter wide transects placed at ten meter intervals.

These transects ran across the site paralleling the rows of soybeans which were planted on it (approximately north to south across the site).

Subsurface tests were placed on rays which emanated from the approximate center of the surface scatter of materials or from the initial find spot at a site. Rays were placed at 60^{o} degree increments. Shovel tests were placed at two, five, or ten meter intervals depending on the size of the surface-occurring scatter of materials. Shovel tests were dug along these rays until cultural materials were no longer present on or beneath the ground surface.

CHAPTER VI

THE RESULTS OF THE PROBABILISTIC SURVEY

Area Examined During the Survey

The stratified random sample of five per cent of the total wooded area within the three-year flowline of the Bayou Cocodrie and Tributaries Project area consisted of 82 transects within Reaches K, L, and M. These transects were distributed over the three reaches in an effort to provide adequate coverage of each of the four geomorphological strata (i.e., abandoned channel, abandoned course, point bar, and backswamp). As stated above, the transects were numbered sequentially as they were examined. A summary of the location of the transects in this order is presented in Appendix II. The discussions which follow will describe the distributions of the transects within each reach and geomorphological stratum.

Coverage by Reach

Initially, 82 randomly selected transect locations resulted in the following number of transects to be examined per reach: 30 transects in Reach K, 21 transects in Reach L, and 31 transects in Reach M. These transects represented two sizes of sample units (i.e., two hectares or four hectares) depending upon the geomorphological stratum being sampled. Table 8 above presented a summary of the total areas initially selected for examination within each reach and geomorphological stratum.

These distributions were modified slightly to maintain the desired five per cent sample size of all wooded areas within the three-year flowline due to problems encountered with the access to several sample unit locations (either by the refusal of right-of-entry by landowners or by restriction due to impassable terrain) and one instance of heavy disturbance. In the latter instance, the transect (Transect 18, Quad 42, Reach L, Abandoned Course Stratum- see Appendix II) lay totally within a farmyard which contained a large pond and a number of other drainage control features (e.g., large berms and ditches). This disturbance and the inability of the survey crew to locate the landowner despite repeated efforts precluded the examination of this sample unit location. The actual number of transects examined per reach were: 31 transects in Reach K, 20 transects in Reach L, and 31 transects in Reach M for a total of 234 hectares. The replacement or reselection of specific transect locations will be discussed below. Table 9 provides a summary of the total areas covered by the survey with respect to each reach and geomorphological stratum.

Table 9. Total Area In Hectares Surveyed within each Geomorphological Stratum in Reaches K, L, and M.

REACH	**K**	**L**	**M**	**Total**	Per cent Coverage by Stratum
STRATUM					
Abandoned Channel	20	0	0	20	16.0%
Abandoned Course	0	6	6	12	16.0%
Point Bar	0	16	38	54	7.8%
Backswamp	84	28	36	148	3.6%
Total	104	50	80	234	4.7%
Per cent Coverage by Reach	2.8%	8.1%*	13.2%	4.7%*	

*Calculated using planimeter area estimates of wooded portions of Reach L instead of GSRDC (1984) data.

While these modifications may have affected the sampling strategy, the changes were necessary since the transects could not be replaced within the appropriate geomorphic stratum in Reach K due to a lack of additional surveyable terrain within the reach at the time of the survey. The extent of the effect of these modifications to the sampling strategy was minimal, however, since the number of transects per reach represented the relative relationships between their total wooded areas. The modifications involved the removal of one transect in Reach L and the addition of one transect in Reach K. The relative relationships between the wooded area in each reach was maintained despite these modifications.

In Reach K, thirty-one transects were examined. Ten of these transects were within the abandoned channel stratum. These transects provided twenty hectares of examined surface. The twenty-one additional transects were in the backswamp stratum. These transects provided 84 hectares of examined surface. In total, 104 hectares of surface were examined in Reach K. This represents 2.8 per cent of the total wooded area within the three-year flowline of the reach. Table 10 provides a summary of the initially selected and final sample unit locations by quadrat within the reach. The additional four-hectare transect replaced a transect of equal size in Reach L which could not be examined due to the inundation of a large area along Little Darbonne and Big Darbonne Bayous. This replacement could not be accomplished within Reach L due to a lack of sufficient wooded area within any quadrats which were not underwater or which had not been surveyed previously.

These transects were distributed from north to south over [illegible] majority of the entire reach. The random selection of sample [illegible] locations resulted in transects adjacent to Bayou Cocodrie, [illegible] Boeuf-Cocodrie Diversion Channel, and the Quaternary Pr[illegible] Terrace. In addition, transects were located at approx[illegible] the maximum possible distance from these features. [illegible] archeological site (16EV61, a late nineteenth cent[illegible] scatter) was discovered during the examination of these [illegible] Figure 6 displays the distribution of transects a[illegible] 16EV61 within Reach K.

Nineteen sample unit locations were exa[illegible] transects within the abandoned course stra[illegible] surveyed. One area was inaccessible due [illegible] water on all sides of the wooded tract. [illegible] point, the entire tract appeared [illegible] groves and standing water. The [illegible] converted to pasturage. This [illegible] pond which seriously affected [illegible] subsurface deposits. As [illegible]

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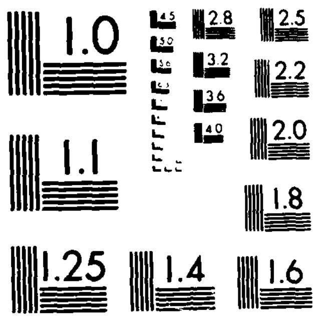

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Table 10. The Location of Sample Units in Reach K (by quadrat).

Abandoned Channel	Abandoned Course	Point Bar	Backswamp	Replaced By
			23*	64
			25	
			33	
			34	
			40	
			69	
			70	
			76*	114
			81*	354
			103	
			159	
			165*	222
			166	
			178	
			180*	241
			207	
			208	
			248	
			255	
			286*	243
			355	
294				
295				
300				
306				
307				
314				
322				
323				
331				
332				

* Not surveyed; replaced

1

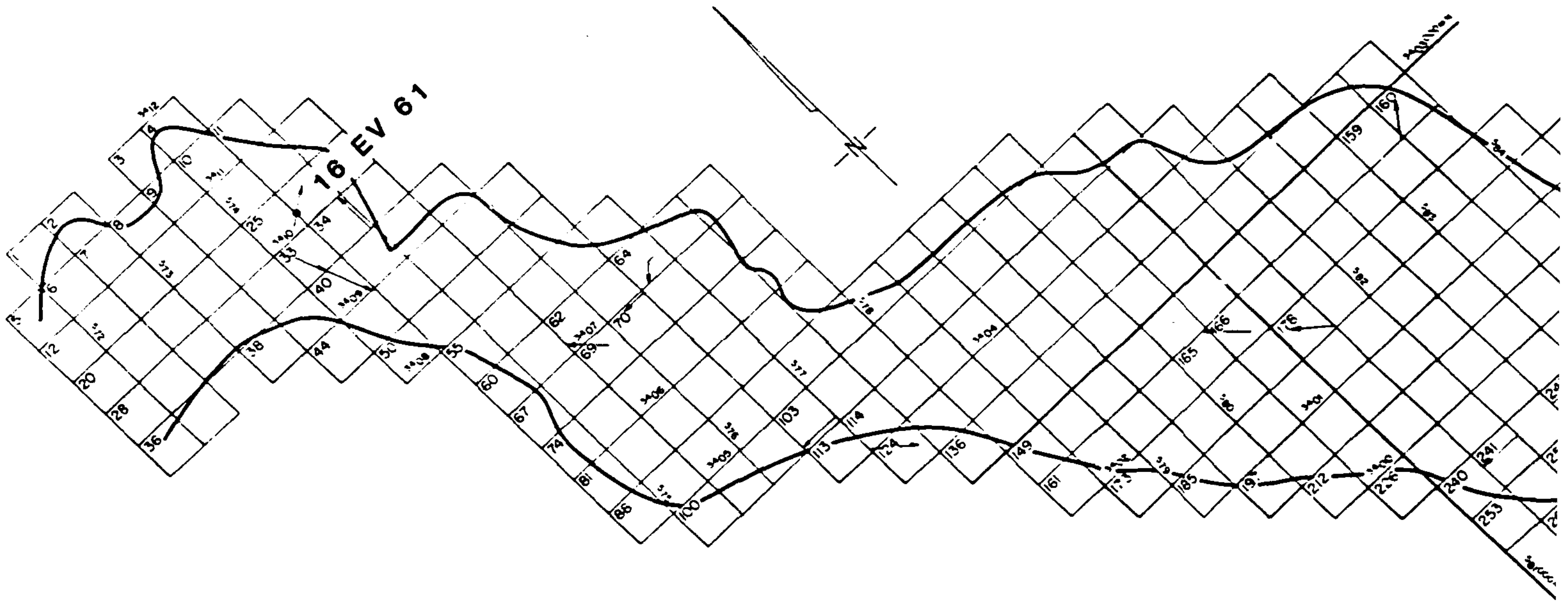
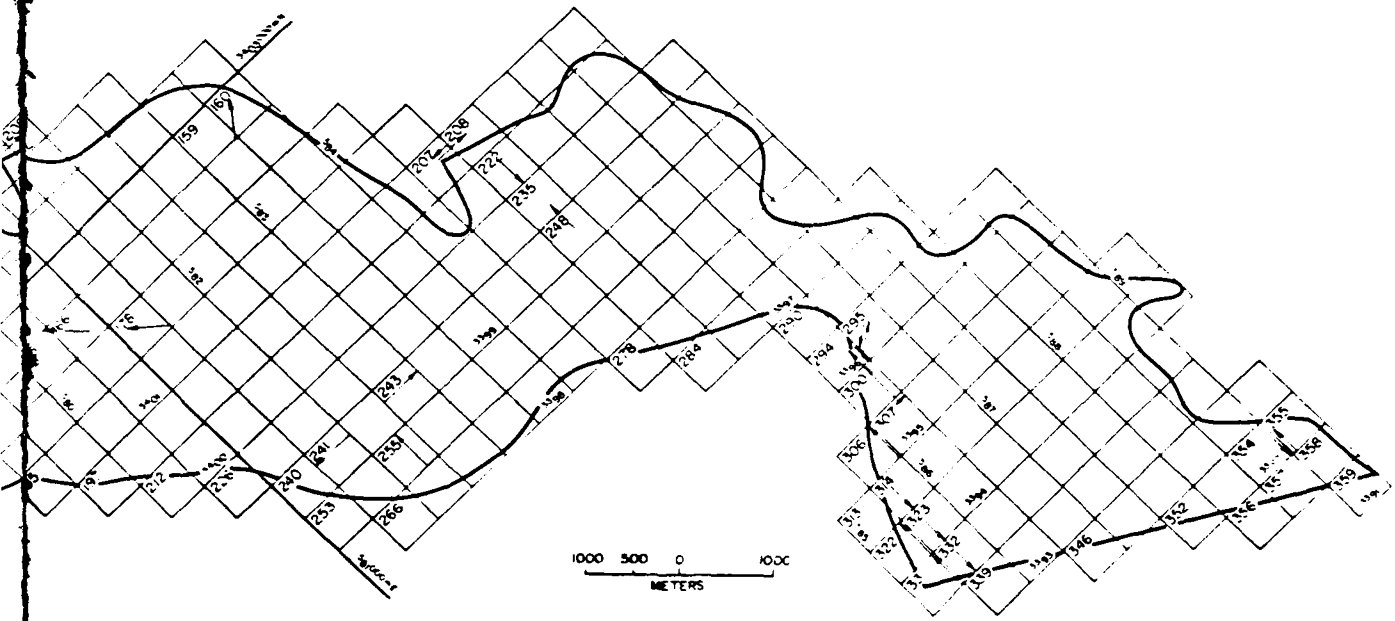


Figure 6. The location of transects and sites in I
● = site, ——► = transect.

2

3



nsects and sites in Reach K.
nsect.

course stratum were selected for examination, these sample units could not be replaced. They were numbered for inclusion in the list of sample units visited but removed from any discussions of sample fractions. That is, these transects were counted within the 82 total sample unit locations but their areas were not included in estimations of the percent coverage within the reach or within the abandoned course stratum. These transects provided 22 hectares of examined surface within Reach L. Seven four-hectare transects were examined in Reach L, providing 28 hectares of examined surface. These 50 hectares of examined surface represent 8.1 per cent of the total wooded area within the reach. Table 11 provides a summary of the initially selected and final transect locations.

The distribution of these units over the reach was limited by the scattered nature of the woodlots. Almost all wooded areas were selected for examination. One archeological site (16SL89, a scatter of prehistoric and historic ceramics) was discovered while a crew was returning from the examination of a sample unit. This site lies in a quadrat which was not selected for examination. Figure 7 displays the distribution of transects and the location of 16SL89 within Reach L.

Thirty-one transects were examined within Reach M. None represent reselections of deletions from the initial sample. Twenty-two of these transects represented two-hectare sample units. The remaining nine transects were four-hectare sample units. These 31 transects provided 80 hectares of examined surface. This represents 13.2 per cent of the total wooded area within the three-year flowline in Reach M. Table 12 provides a summary of these transect locations.

As in Reach L, many of the woodlots are scattered and interspersed with cleared land. However, the random selection of transect locations resulted in the placement of sample units over all portions of the reach. Five archeological sites were discovered (16SL90, 16SL91, 16SL92, 16SL93, and 16SL94). Figure 7 displays the distributions of the transects and the locations of the sites in Reach M.

In summary, 82 sample unit locations were visited within Reaches K, L, and M. Eighty of these units were examined for archeological remains. This resulted in the examination of 234 hectares of surface within the wooded portions of the three-year flowline in the abovementioned reaches. This represents 4.7 per cent of the total wooded area within the three-year flowline of these reaches.

Table 11. Location of sample units (by quadrat) in Reach L.

Abandoned Channel	Abandoned Course	Point Bar	Backswamp	Replaced By
	2	2#		
	9			
	10			
	18+			
		21		
		27		
		23		
		34		
		39		
	42+			
		46		
		78		
			96*	K-355
			97*	95
			98*	109
			100*	132
			112	
			113	
			124*	133
			125	

* Not surveyed; replaced
+ Not surveyed; not replaced
# Contains two strata

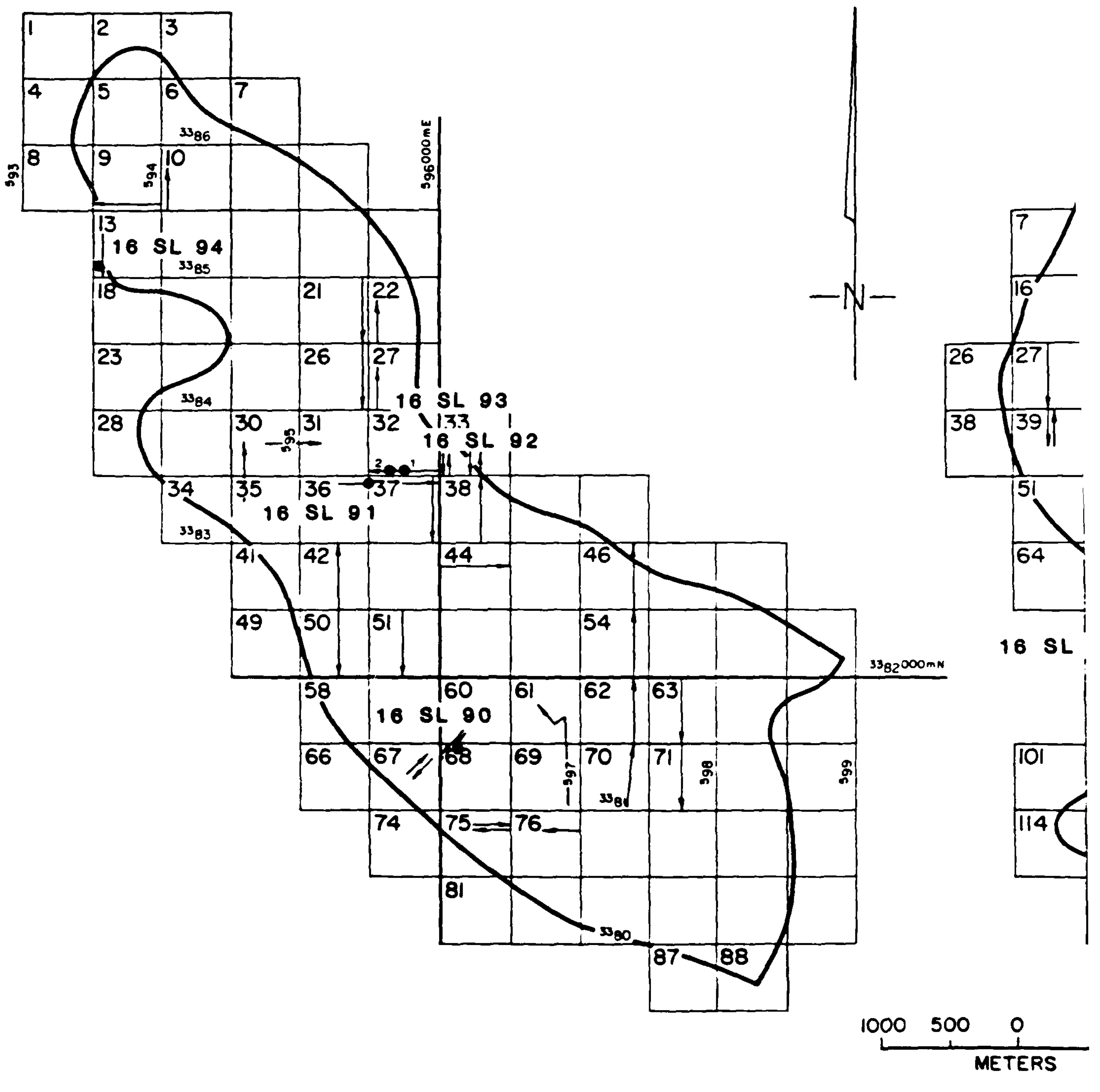
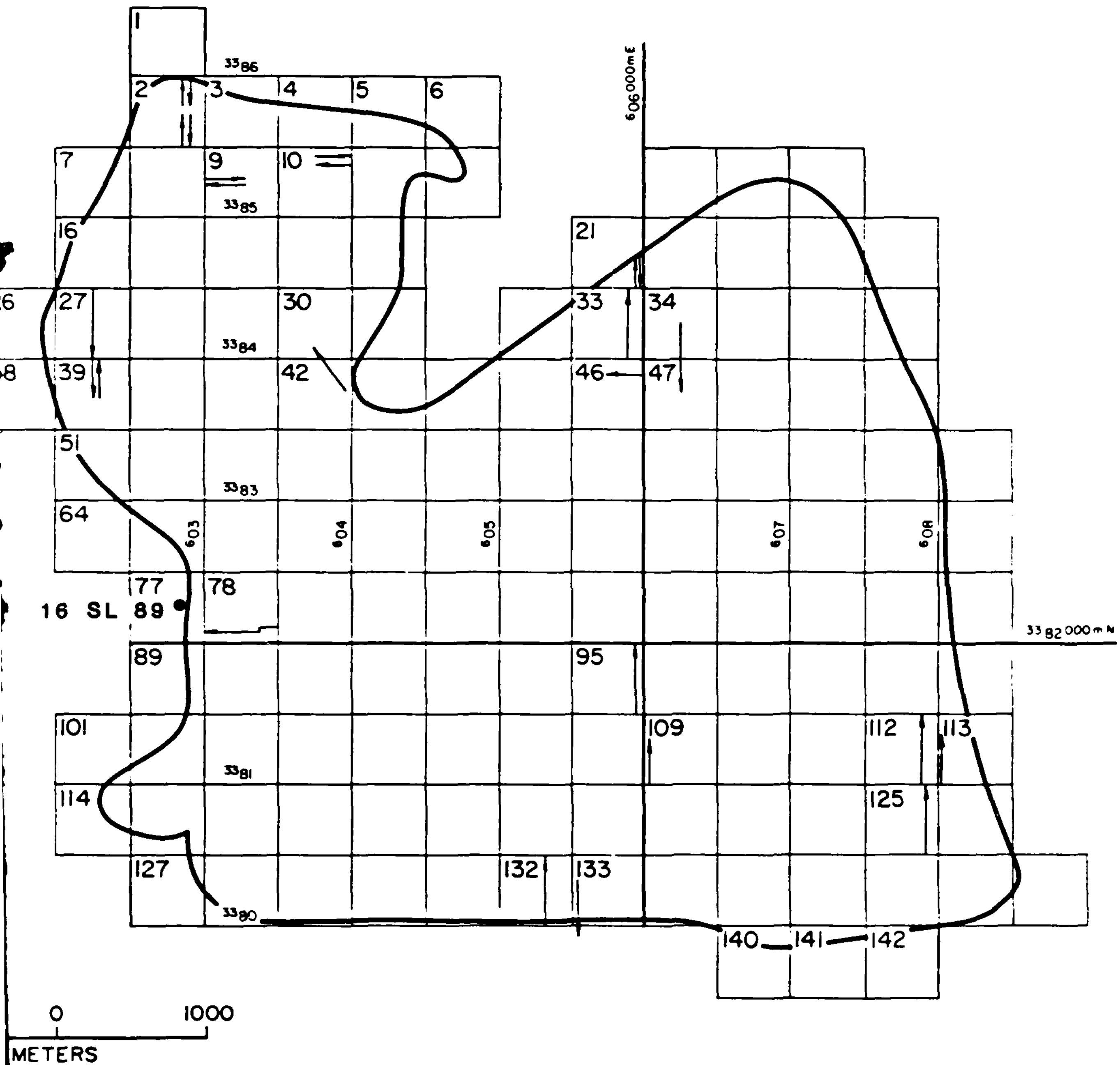


Figure 7. The location of transects and
● = site, ——► = transect.



cts and sites in Reaches L and M.
ct.

Table 12. Location of sample units (by quadrat) in Reach M.

Abandoned Channel	Abandoned Course	Point Bar	Backswamp	Replaced By
			9	
			10	
			13	
			21	
			22	
			26	
			27	
			30	
			31	
	32			
	33	33#		
	37	37#		
		38		
		42		
		44		
		46		
		50		
		51		
		54		
		61		
		62		
		63		
		67		
		68		
		69		
		70		
		71		
		75		
		76		

Contains two strata

Coverage by Geomorphic Stratum

The areas examined within each geomorphological stratum changed slightly from the initially weighted sample fractions selected for each stratum. This was the result of restricted access and serious surface modifications within two of the initially selected quadrats. Discussions of the sampling fractions with respect to the area actually surveyed are presented below.

Within the abandoned channel stratum, ten sample unit locations were selected initially for examination. All ten of these locations were visited and surveyed. All were located in Reach K. These transects provided twenty hectares of examined surface. This represented 16.0 per cent of the total wooded area in this stratum within the three-year flowline of the entire project area. No archeological sites were discovered in areas identified as abandoned channel deposits.

Within the abandoned course stratum, eight sample unit locations were selected initially for examination. All eight were visited; however, only six were actually surveyed due to restricted access and extensive surface and subsurface disturbance. Three of the examined transects were located in Reach L and three were located in Reach M. The two transects which were visited but not included in the sample were located in Reach L. These transects provided twelve hectares of examined surface. This represented 16.0 per cent of the total wooded area in this stratum within the three-year flowline of the entire project area. Three archeological sites were discovered in areas identified as abandoned courses. These included 16SL91, 16SL92, and 16SL93. All of these sites were discovered in Reach M. Additionally, 16SL89 was discovered in the abandoned course stratum but outside of the sampled area.

Twenty-seven sample unit locations were selected and examined within the point bar stratum. Eight of these transects were located in Reach L. The remaining nineteen were located in Reach M. These transects provided 54 hectares of examined surface. This represented 7.8 per cent of the total wooded area in this stratum within the three-year flowline of the entire project area. One archeological site (16SL90) was discovered within this stratum in Reach M.

Thirty-seven sample unit locations were initially selected within the backswamp stratum. Originally, twenty of these transects were to be in Reach K, eight in Reach L, and nine in Reach M. Due to the presence of extensive swamps within the wooded portions of Reach L, many of the sample unit locations with Reach L had to be reselected. One of these reselected transects was placed in Reach K since all available backswamp areas in Reach L had been selected or were under water. This resulted in the following final distribution of backswamp transects within the reaches: twenty-one transects in Reach K, seven transects in Reach L, and nine transects in Reach M. These transects provided 148 hectares of examined surface. This represented 3.6 per cent of the total wooded area in this stratum within the three-year flowline of the entire project area. Two archeological sites (16EV61 and 16SL94) were discovered in areas identified as backswamp. 16EV61 was discovered in Reach K while 16SL94 was discovered in Reach M.

In summary, 82 sample unit locations were selected for examination within the four geomorphological strata. Eighty of these locations were surveyed. The two transects removed from the sample were both identified as abandoned courses. This resulted in a lower sampling fraction for this stratum than initially specified. Since this revised sampling fraction (16.0 per cent) equalled the next highest fraction among all of the strata, a significant loss in representation for the abandoned course stratum was not anticipated. The area examined per geomorphological stratum was: twenty hectares (16.0 per cent) in abandoned channel, twelve hectares (16.0 per cent) in abandoned course, fifty-four hectares (7.8 per cent) in point bar, and 148 hectares (3.6 per cent) in backswamp.

Sites Located During the Survey

Reach K

The Mire site, 16EV61, is a sparse surface scatter of historic ceramics and glass located in a soybean field, in the backswamp stratum along Transect 53 in Quadrat 25 of Reach K. The areal dimensions of 16EV61 are 200 meters north-south by 40 meters east-west, in an elliptical configuration (Figure 8). The site is situated on a floodplain between the Boeuf-Cocodrie Diversion Channel, located 250 meters due west, and Bayou Boeuf, which lies 1750 meters to the northeast. The Mire site is on land owned by Mr. Homer Mire of Bunkie, Louisiana.

The systematic examination of 16EV61, which included a controlled surface collection and shovel testing, revealed that this site consists of a sparse surface scatter only. No subsurface deposits were encountered. The late nineteenth century horizon of this site is represented by twenty-six artifacts, which include fifteen sherds of whiteware/ironstone, two sherds of late spatterware, two sherds of porcelain, one sherd of annular yelloware, one sherd of hand-painted polychrome pearlware, one sherd of stoneware ale bottle, two glass bottle necks, and one piece of slag.

The lack of structural remains, such as bricks or nails,

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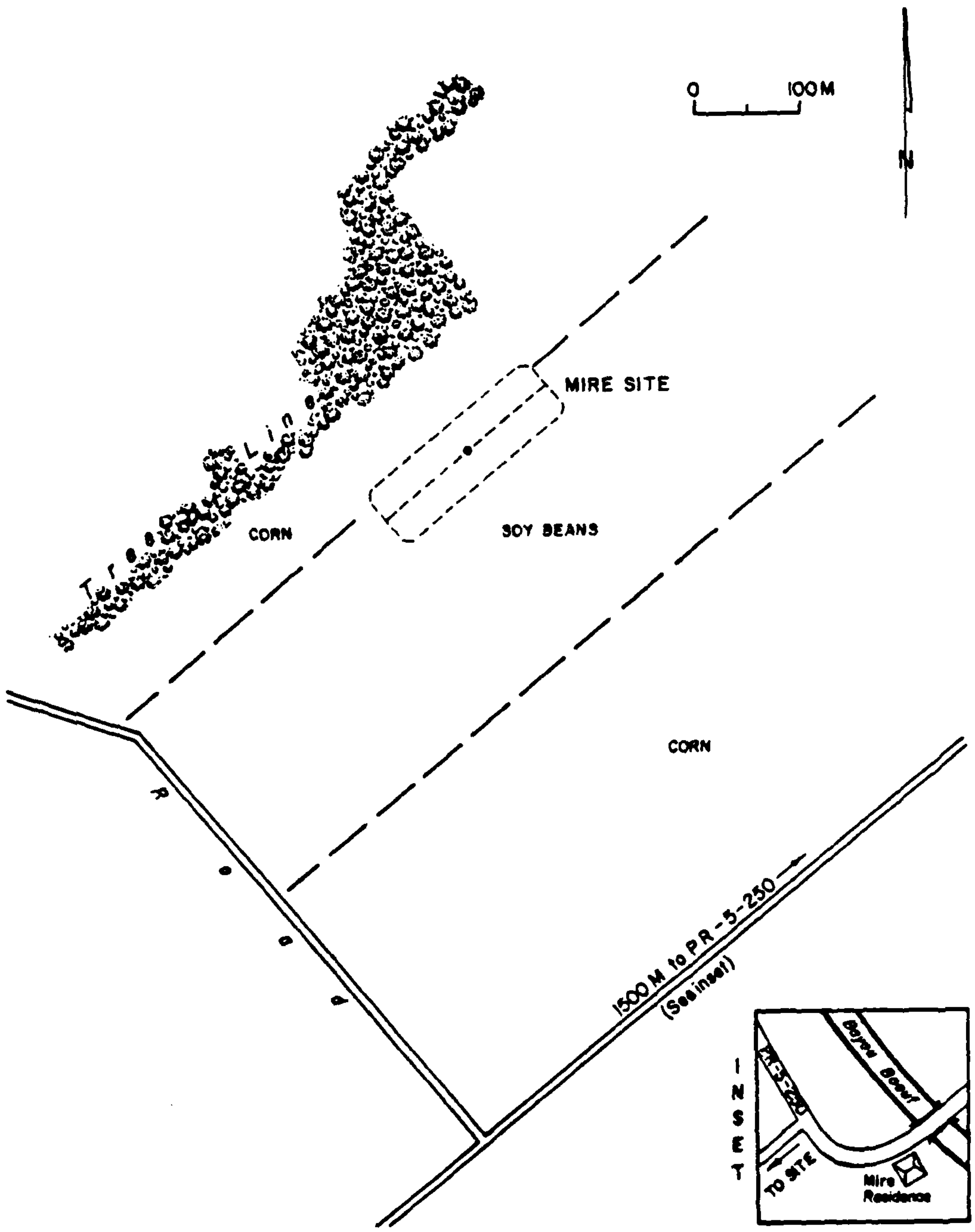

Figure 8. Sketch map of the Mire site (16EV61).

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suggests that 16EV61 was not a habitation site. It may represent an activity area or a refuse disposal area. At one time, according to Mr. Mire, several houses had been located on the edge of the field in which 16EV61 lies, at an approximate distance of 800 meters to the southeast. The Mire site may be associated with these former dwellings.

Due to the highly disturbed nature of this surface scatter and the lack of subsurface components, the research potential of the Mire site is limited to locational and temporal data. 16EV61 is not considered eligible for nomination to or inclusion on the National Register of Historic Places.

Reach L

The Noel Slough site, 16SL89, is a sparse, multi-component surface scatter located in the abandoned course stratum in Quadrat 77 of Reach L. The discovery of the Noel Slough site is an example of serendipity, since it was discovered while in transit to a randomly selected quadrat located in the reach. The site has been excluded from discussions involving site densities within the reach or the geomorphic stratum. It is situated fifteen meters to the north-northeast of the Noel Slough (Figure 9). The site consists of a very sparse scatter of prehistoric and historic ceramics. The area is presently under cultivation for the production of soybeans. The areal dimensions of 16SL89 are 20 meters north-south by 10 meters east-west, with its configuration being elliptical.

A systematic examination of the site, which included a controlled surface collection and shovel testing, failed to reveal additional materials or deposits other than the four sherds encountered on the surface. No subsurface deposits were encountered. The artifact assemblage consisted of one creamware sherd from the early nineteenth century, and three sherds of Baytown Plain **var. unspecified.**

The extremely sparse content of 16SL89, coupled with the total lack of subsurface deposits, renders little research potential beyond locational and temporal information. Therefore, this site is not considered eligible for nomination to or inclusion on the National Register of Historic Places.

Reach M

The Bayou Toulouse site, 16SL90, is a multi-component surface scatter located in a fallow field. It lies in the point bar stratum, along Transect 16 in Quadrat 68, Reach M. It is situated on the west bank of Bayou Toulouse, 200 meters due east of the bayou, on the edge of a cypress swamp (Figure 10). The areal

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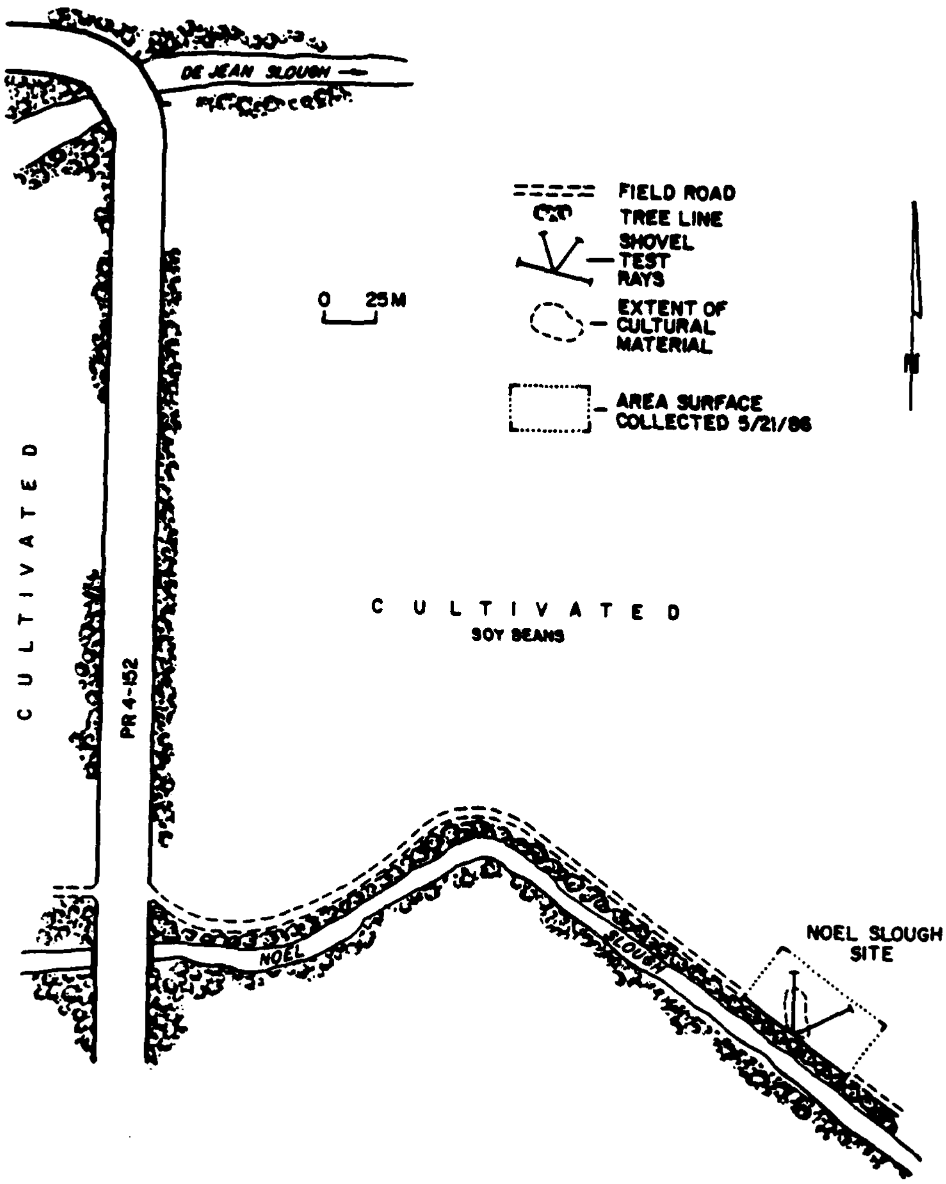

Figure 9. Sketch map of the Noel Slough site (16SL89).

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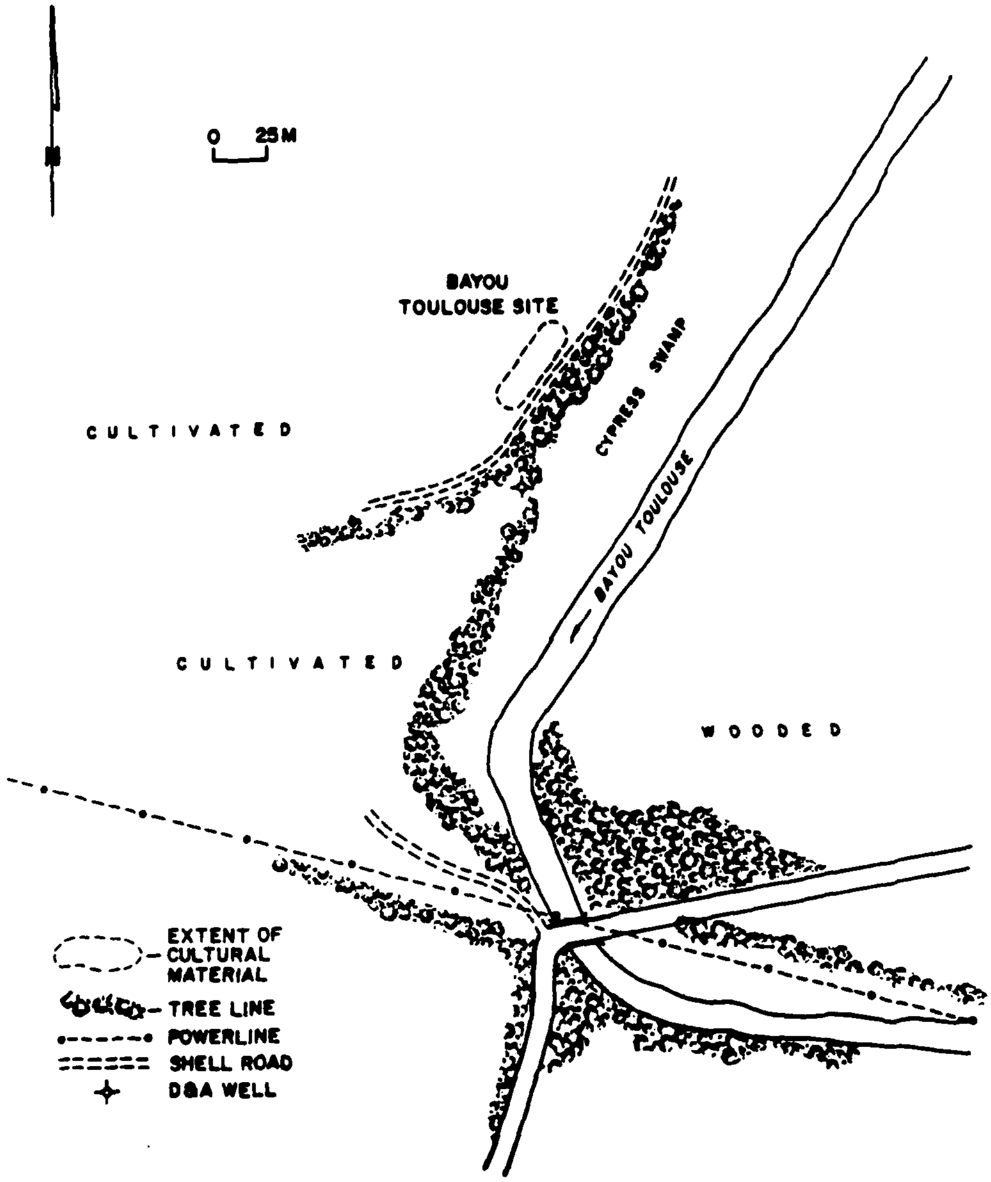

Figure 10. Sketch map of the Bayou Toulouse site (16SL90).

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dimensions of 16SL90 are 80 meters north-south by 25 meters east-west, in an elliptical configuration.

A systematic examination of the site, which included a controlled surface collection and shovel testing, showed 16SL90 to consist of a sparse surface scatter with no subsurface component. The artifacts collected consisted of one chert biface, one sherd of Rouen faience ceramic, four sherds of whiteware/ironstone, two wire nails, one carbon rod, and seven bone fragments. The relatively small amount of significant artifacts, coupled with the lack of subsurface deposits, show that 16SL90 has little potential for research beyond locational and temporal information. Therefore, it is not considered eligible for nomination to or inclusion on the National Register of Historic Places.

The Bertrand site, 16SL91, is a multi-component surface scatter located in the abandoned course stratum along Transect 37 in Quadrat 37, Reach M. It is 375 meters due south of Bayou Toulouse, on this waterway's flood plain. 16SL91 was discovered while surveying Transect 37, in a fallow field that is owned by Mr. Philip LeBlanc of Port Barre, Louisiana.

The areal dimensions of the Bertrand site are 60 meters north-south by 60 meters east-west, in a circular configuration (Figure 11). This multi-component artifact assemblage consisted of two Middle Woodland chert projectile points (Edwards dart points), six pieces of chert debitage, three pieces of quartzite debitage, one piece of siltstone debitage, six large wire nails, eight pieces of glass, two sherds of brownware, and one ceramic marble. A systematic examination of the site, which included a controlled surface collection and shovel testing, revealed that 16SL91 consists of a light surface scatter only, with no subsurface components.

According to Mr. J.J. Bertrand of Opelousas, Louisiana, an oil well was drilled at the approximate location of 16SL91 some time after the end of World War II. This drilling operation involved the construction of a log road and platform. In addition, two small sludge ponds were constructed at the well site. All signs of these features have been eradicated from the landscape to accomodate cultivation of the area. Considering this information, the historic component of this site has a high probability of being related to the recent drilling activities carried out at this location. The drilling activities, including the ensuing dismantling of the drilling platform and log road, and the reclamation of the land for purposes of cultivation, have destroyed any extant subsurface deposits which may have been present. Due to the small number of artifacts contained in this surface scatter, and its lack of subsurface deposits, 16SL91 is deemed to have little research potential other than locational and

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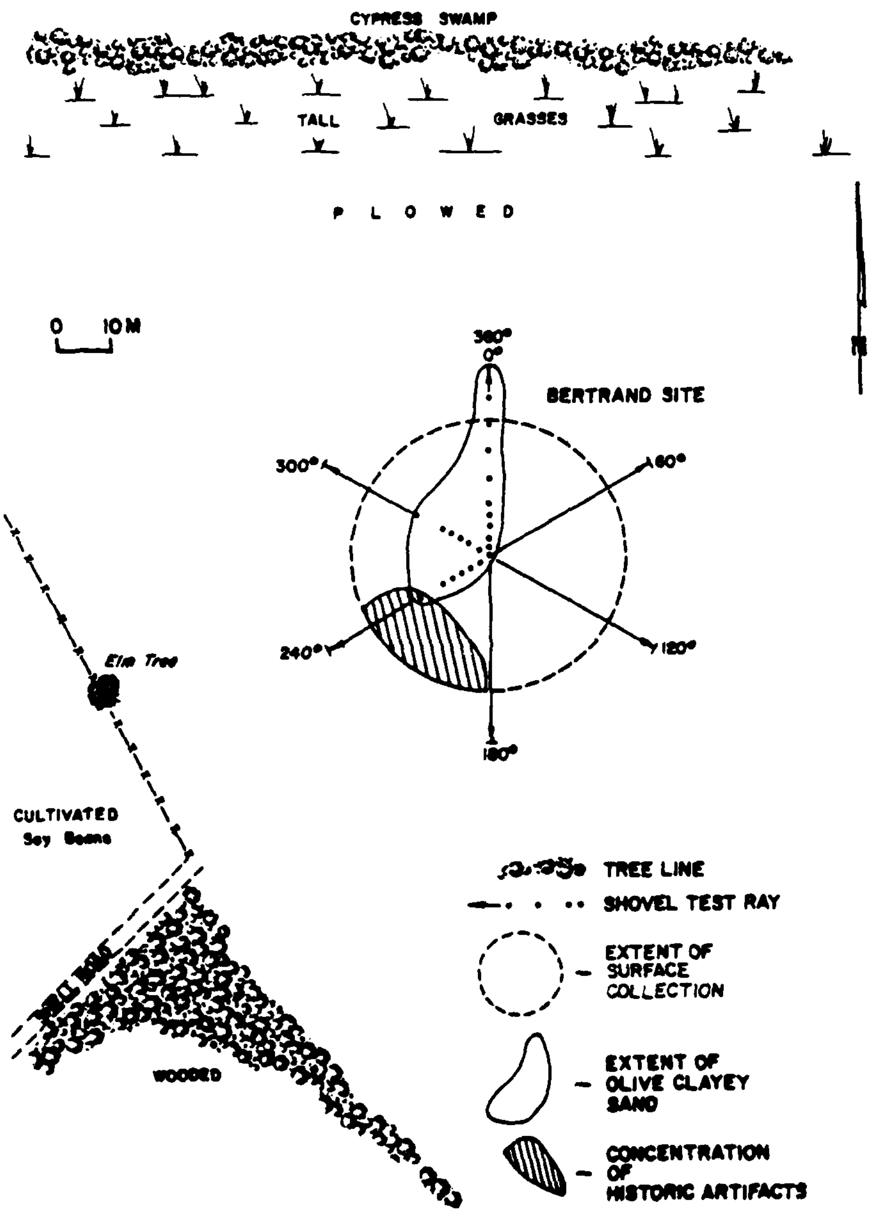

Figure 11. Sketch map of the Bertrand site (16SL91).

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temporal information. It is not considered eligible for nomination to or inclusion on the National Register of Historic Places.

The LeBlanc #1 site, 16SL92, is a single component surface scatter that is located in the abandoned course stratum (Figure 12). It was discovered along Transect 40 in Quadrat 32 of Reach M. The areal dimensions of 16SL92 are 20 meters north-south by 35 meters east-west, in an elliptical configuration. It is situated 350 meters due south of Bayou Toulouse, between scattered areas of cypress swamp. This site is presently in a fallow field owned by Mr. Philip LeBlanc of Port Barre, Louisiana.

A systematic examination of the site, which included a controlled surface collection and shovel testing, revealed that 16SL92 consists of a light surface scatter of early to mid-twentieth century artifacts with no subsurface component. The artifacts collected consisted of twenty-five sherds of whiteware/ironstone, one sherd of late spatterware, one burned ceramic sherd, and forty-four pieces of glass. These artifacts may represent a refuse disposal area related to the LeBlanc #2 site, 16SL93, which is located approximately 100 meters to the west of the LeBlanc #1 site. Both of these sites contained sherds of whiteware/ironstone which had identical patterns and may have derived from the same set of plates if not from the same vessel. The LeBlanc #2 site will be discussed in detail below.

Due to the low density of artifacts collected at 16SL92 and its lack of any subsurface component, the research potential for this site is limited to locational and temporal information. The LeBlanc #1 site is not considered eligible for nomination to or inclusion on the National Register of Historic Places.

The LeBlanc #2 site, 16SL93, is a surface scatter of historic materials located in the abandoned course stratum along Transect 40 in Quadrat 32 of Reach M (Figure 12). The areal dimensions of 16SL93 are 50 meters north-south by 50 meters east-west, in a circular configuration. It is situated 375 meters due south of Bayou Toulouse, between scattered areas of cypress swamp. 16SL93 presently lies in a fallow field owned by Philip LeBlanc of Port Barre, Louisiana.

A systematic examination of the LeBlanc #2 site, which included a controlled surface collection and shovel testing, revealed only a medium density surface scatter with no subsurface component. The artifacts collected consisted of nineteen sherds of whiteware/ironstone, two pieces of porcelain, one sherd of English majolica, 117 pieces of glass including three intact bottles, two pieces of earthenware drain pipe, four brick fragments, and sixteen bone fragments. There was a total of

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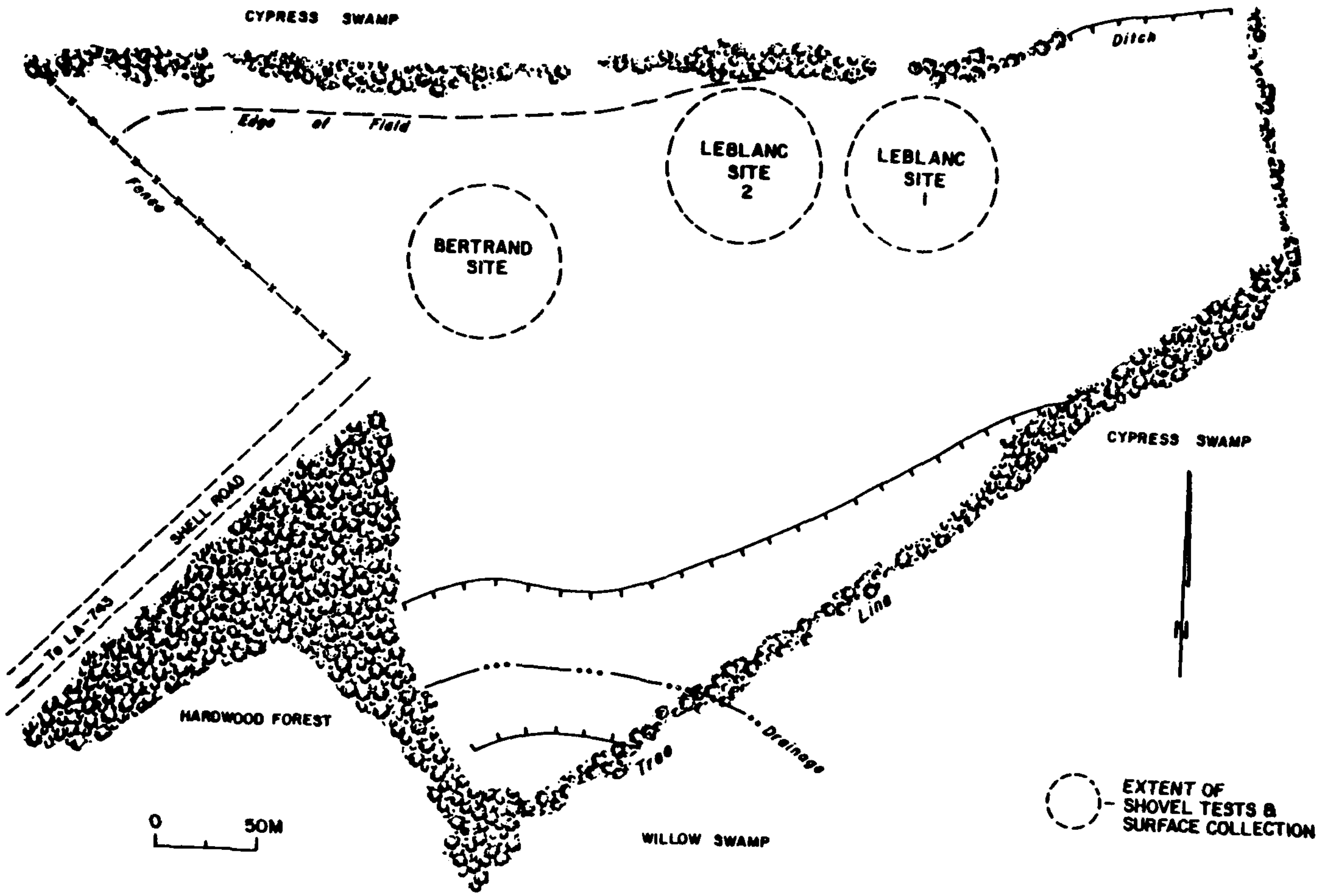

Figure 12. Sketch map of the location of the LeBlanc #1 (16SL92) and LeBlanc #2 (16SL93) sites.

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thirty-seven shovel tests made at this site. None provided evidence for a foundation or other subsurface remains. However, the number and variety of artifacts, including the faunal remains, tends to support the supposition that this surface scatter represents a house site. It is likely that any foundation was destroyed when the area was converted to agricultural use. In addition, the LeBlanc #1 site and the Bertrand site, two contemporary scatters located to the east and west respectively, may represent refuse disposal or activity areas associated with this site.

Due to the highly disturbed nature of this site, coupled with the total lack of subsurface deposits, the LeBlanc #2 site has limited research potential beyond locational and temporal data. Therefore, 16SL93 is not considered eligible for nomination to or inclusion on the National Register of Historic Places.

The Milburn site, 16SL94, is a multi-component mound site located in the backswamp stratum along Transect 21 in Quadrat 13 of Reach M. The site lies on land owned by Mr. Milburn of Opelousas, Louisiana (Figure 13). This site has a large quantity of artifacts contained in a surface scatter and a subsurface component which is still largely intact. 16SL94 is situated in a recently developed (i.e., cleared within the last two years) soybean field, on the floodplain of Bayou Carron, which lies 850 meters to the northwest. The areal dimensions of this site are 110 meters north-south by 120 meters east-west, in a circular configuration.

A systematic examination of the site, which included auger testing, shovel testing, and a controlled surface collection, produced 221 ceramic sherds (Figure 14). This collection contained ceramic artifacts representative of three prehistoric phases. These are Marksville, Troyville, and Coles Creek. Additional prehistoric artifacts included one small chert flake, one piece of ocher, and twelve bone fragments. One of these bone fragments was polished and showed signs of being worked. The other component of this site is an early to mid-nineteenth century horizon. Artifacts from this component included one sherd of pearlware, one sherd of brownware, one sherd of whiteware/ironstone, and one clear pharmaceutical bottle neck. Shovel and auger tests revealed that 16SL94 has a largely intact subsurface component at a depth of 15 to 45 centimeters below ground surface. One shovel test produced evidence of a possible hearth.

The artifacts occurring at the Milburn site area are associated with a low mound which rises approximately 1.5 meters above the surrounding terrain. This mound feature has several small hummocks associated with it. Artifacts are scattered over

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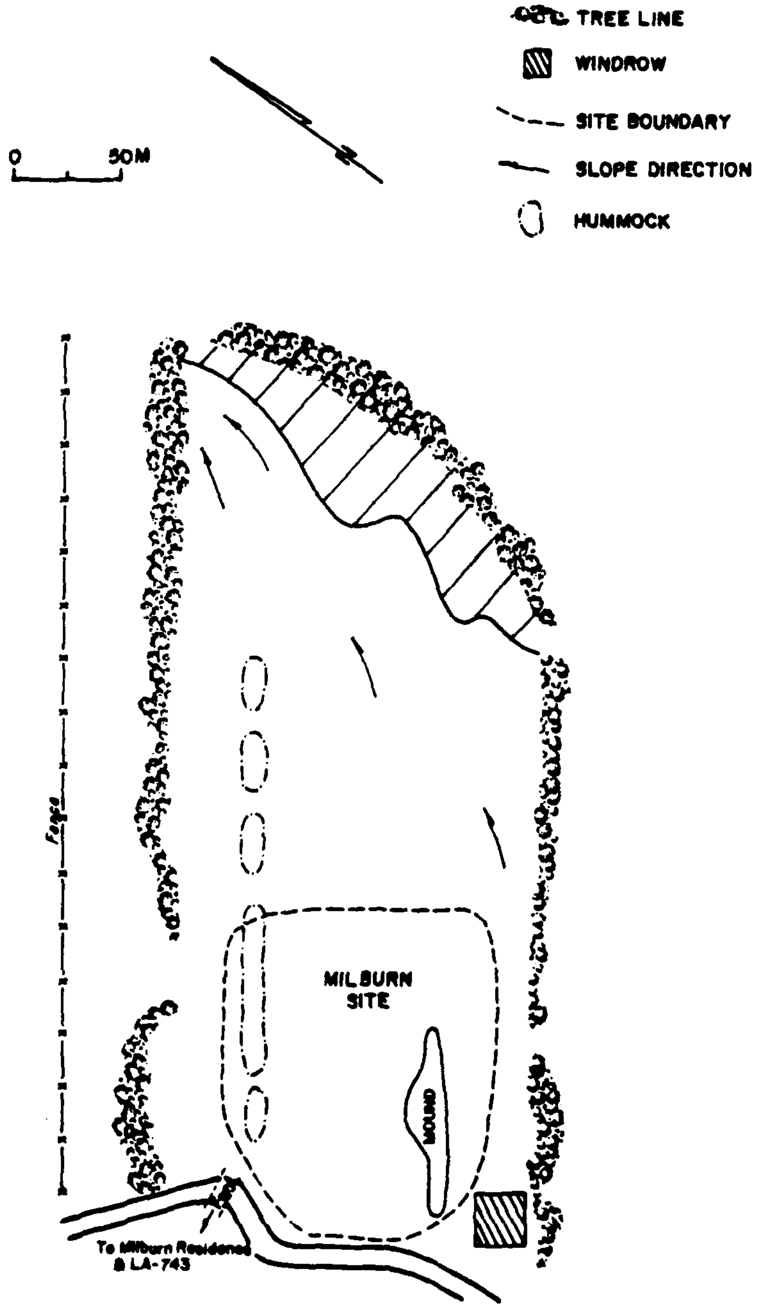

Figure 13. Sketch map of the Milburn site (16SL94).

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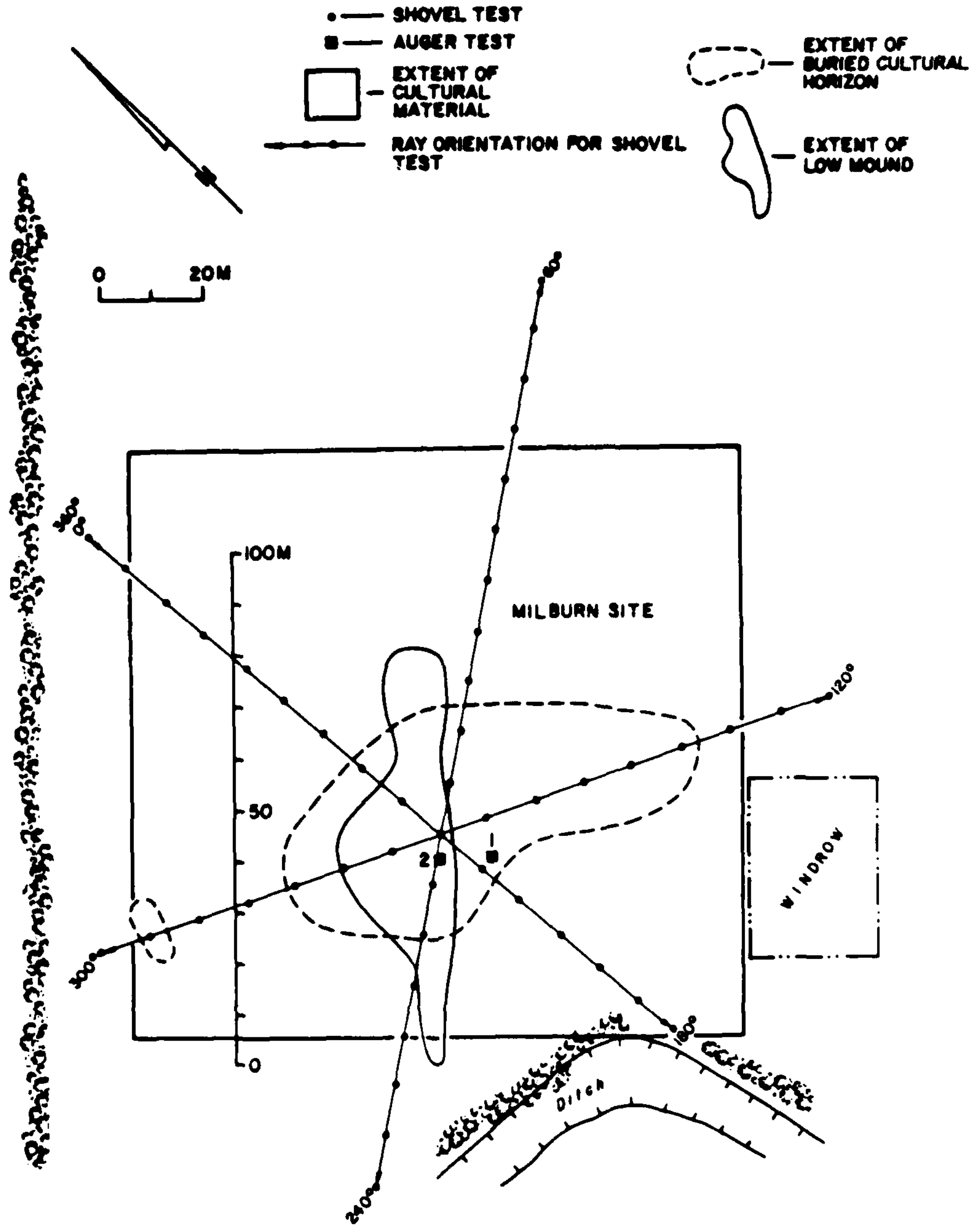

Figure 14. Location of subsurface tests and deposits at the Milburn site (16SL94).

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these surface irregularities and occur in higher densities to the east of the mound (Figure 8). The evidence for a buried cultural horizon on the mound proper is located on its northern face. This horizon, as noted above, generally lies at depths of 15 to 45 centimeters below the surface. In some places, it occurs below a seemingly sterile layer of silt loam. This midden layer contains ceramic sherds, bone fragments, numerous flecks of charcoal, and at least one possible subsurface feature. In addition, there is a small area located approximately 30 meters to the east northeast of the mound, which also appears to have a midden component (Figure 14). The effect of cultivation on the site has been to scatter the upper layer of artifacts from these two deposits across an area approximately 130 meters by 115 meters, in a north-south direction, along the orientation of the plow rows (Figure 15).

The Milburn site, 16SL94, has strong research potential (Criterion D, 36 CFR 60.4) due to its high density of artifacts, the presence of intact subsurface deposits, and the relatively recent (i.e., modern) agricultural development of the site area. This site can provide the opportunity to develop temporal, locational, and activity related data concerning the Marksville, Troyville, and Coles Creek phases of prehistoric occupation and temporal and locational data from the late nineteenth century in the Opelousas area.

General prehistoric themes for Management District III, which includes St. Landry Parish (as defined by Smith et al. 1983:64), which could be addressed through any future investigations at 16SL94 include: prehistoric adaptation in the Alluvial Valley and general culture history of the district. More specific themes for the cultural components represented at the site include: description of the Marksville and Troyville-Coles Creek cultures, adaptation to the Alluvial Valley during the Marksville and Troyville-Coles Creek periods, mound building during the Marksville and Troyville-Coles Creek periods, and the form, extent, and importance of agriculture during the Marksville and Troyville-Coles Creek periods through the recovery of subsistence remains from the intact subsurface middens or features which exist at the site (Smith et al. 1983:172, 183-184).

In addition to addressing these themes, particular research goals, as defined by Smith et al. (1983), could be addressed through any future investigations at 16SL94. For the Marksville period, these include: the definition of temporal limits for Marksville period occupations through the recovery of datable materials from subsurface features, the distribution of Marksville sites throughout Louisiana, a description of the diversity of artifact assemblages associated with Marksville occupations, the definition of Marksville subsistence and settlement patterns, to include the relationship of smaller sites

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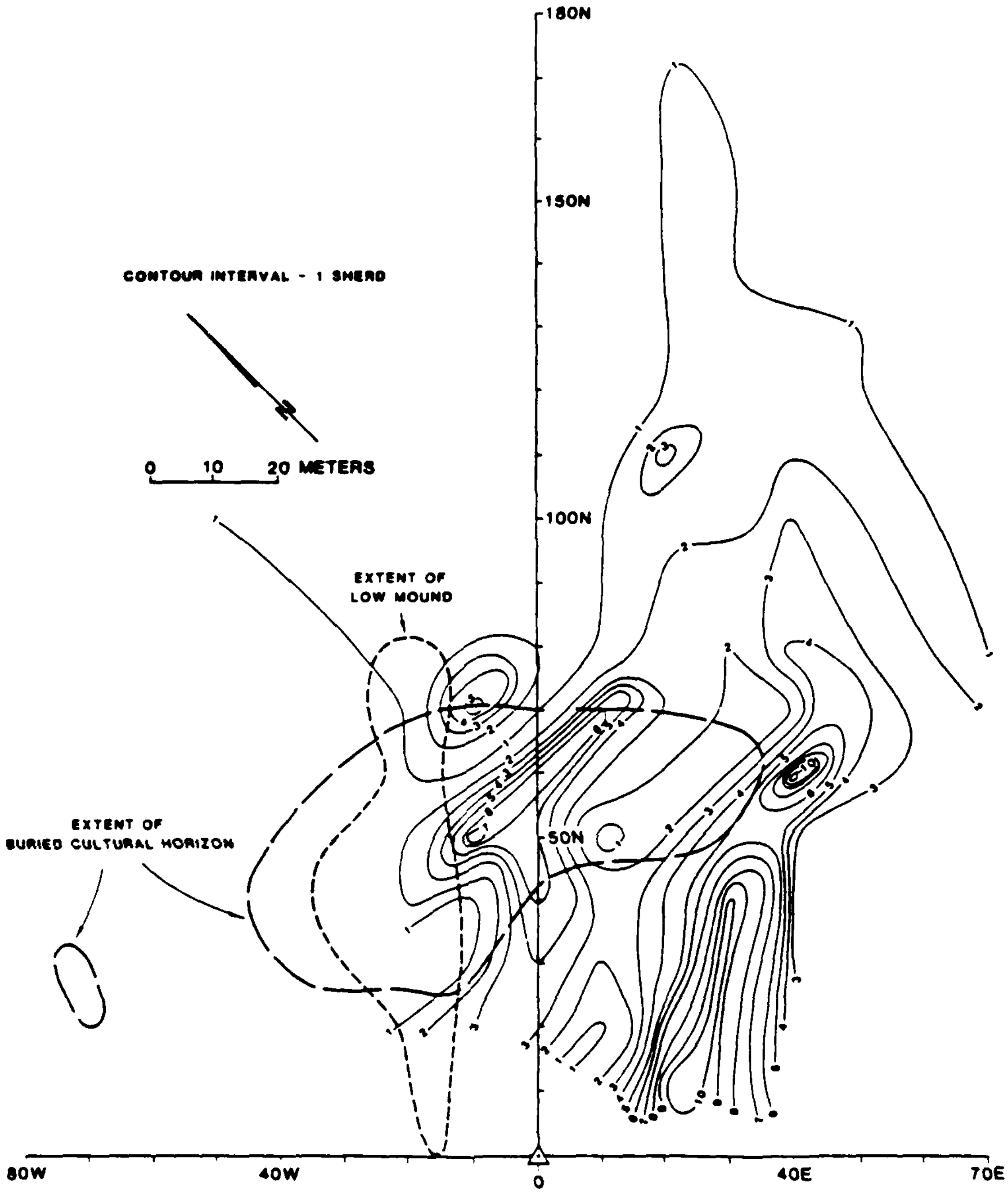

Figure 15. The distribution of ceramic artifacts over the Milburn site (16SL94).

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to the larger main centers, such as the Marksville site (16AV1) (Smith et al. 1983:175). For the Troyville-Coles Creek period, these include: the definition of temporal limits for the period and its associated phases through the recovery of datable materials from subsurface features, the distribution of Troyville-Coles Creek period sites throughout Louisiana, the description of the diversity of artifact assemblages associated with Troyville-Coles Creek occupations, the definition of subsistence and settlement patterns evident at or derived from the locations of Troyville-Coles Creek sites, the examination of a non-ceremonial site associated with the period, and possibly, the examination of the relationships of Troyville-Coles Creek occupations with surrounding contemporary cultures (Smith et al. 1983:190).

In addition, the nature of the site during both major periods of occupation (i.e., as a village or hamlet associated with a small, possibly man-made mound) represents a component of the settlement systems of both Marksville and Troyville-Coles Creek periods which has received little attention to date. While such smaller sites are fairly common throughout Louisiana, the presence of a small mound may distinguish this site from otherwise similar villages or hamlets. Thus, 16SL94 may represent a relatively unique component of the settlement systems of the Marksville and/or Troyville-Coles Creek. Further surveys and examinations of existing site records would be necessary to verify this possibly unique aspect of the site.

Given the potential which exists at 16SL94 for addressing the research goals defined above and its relatively unique representation as a component in the overall settlement systems of the Marksville and Troyville-Coles Creek periods, the Milburn site (16SL94) is recommended as eligible for nomination to and inclusion on the National Register of Historic Places.

Artifact Analyses

Prehistoric Artifacts

Prehistoric materials were recovered from four of the seven sites discovered during the survey of the Bayou Cocodrie and Tributaries Project area. Ceramic, lithic and faunal remains constitute the entire assemblage of prehistoric artifacts. Each of these classes will be discussed separately and by site. Ceramic analyses employed the type-variety system developed for the lower Mississippi valley by Phillips (1970). Additional types are after Toth (1974). Lithic artifacts were identified as to lithic raw material, functional association, and temporal association if possible. Faunal remains associated with the prehistoric sites were identified as to species and skeletal element where possible.

CERAMIC ARTIFACTS

Two of the prehistoric sites discovered during the survey contained prehistoric ceramic materials. These sites represented a resource extraction locality (16SL89) and a maintenance site (16SL94). These assemblages are presented and discussed below.

16SL89. The Noel Slough site contained three sherds identified as Baytown Plain var. unspecified. These sherds could be associated with either Marksville, Troyville, or Coles Creek phases. Further assessments of these materials is impossible. This site is considered to represent a resource extraction locus due to the low density and low diversity of prehistoric artifacts.

16SL94. The Milburn site contained 221 prehistoric sherds. While plainwares predominate this assemblage, a number of decorated sherds were discovered. Identifications of the plain and decorated wares permitted the definition of three prehistoric phases at this site. These included Marksville, Troyville, and Coles Creek. Counts of the sherds per each type are displayed in Table 13.

Types associated with the Marksville occupation include Marksville Stamped var. Manny, Marksville Incised var. Yokena, Baytown Plain var. Reed, and Baytown Plain var. Satartia. In addition, an unidentified punctate is felt to be associated with this component due to the similarity of the paste and surface finish with Baytown Plain var. Reed. These types represent 53.5 per cent of the entire ceramic assemblage from 16SL94.

Types associated with the Troyville phase include Coles Creek Incised var. Hunt and Baytown Plain var. Reed. It should be noted that the second type-variety occurs from middle to late Marksville phase and through the ensuing Troyville phase. It has been included as an indicator of either occupation. Without the plainware, ceramics associated with the Troyville phase constitute 0.5 per cent of the entire ceramic assemblage.

Types associated with the Coles Creek occupation at 16SL94 include Coles Creek Incised var. Coles Creek, Pontchartrain Check-stamped var. Pontchartrain, Baytown Plain var. Percy Creek, and Baytown Plain var. Baytown. An unidentified variety of incised and punctated decoration with similarities in paste and surface finish to Baytown Plain var. Baytown is felt to be associated with this component as well. These types constitute 35 per cent of the ceramic assemblage from the site.

Table 13. Prehistoric Ceramic Types from the Milburn Site (16SL94).

Type - Variety	Frequency	Association
Marksville Stamped var. Manny	3	Middle to Late Marksville
Marksville Incised var. Yokena	1	Middle to Late Marksville
Coles Creek Incised var. Hunt	1	Baytown
Coles Creek Incised var. Coles Creek	1	Coles Creek
Pontchartrain Incised var. Pontchartrain	1	Coles Creek
Baytown Plain var. Satartia	55	Middle to Late Marksville
Baytown Plain var. Reed	51	Late Marksville to Baytown
Baytown Plain var. Percy Creek	22	Coles Creek
Baytown Plain var. Baytown	47	Coles Creek
Baytown Plain var. unspecified	19	Unknown
Unidentified incised and punctate (on Baytown Plain var. Baytown?)	1	Coles Creek
Unidentified punctate (on Baytown Plain var. Reed?)	1	Late Marksville to Baytown
Unidentified Plainwares	4	Unknown

The remaining 11 per cent is represented by Baytown Plain *var. unspecified* and unidentified plainwares. In addition, one piece of burned clay or daub was recovered from the possible hearth in Shovel Test 1, Ray 0°.

This site is considered to represent a maintenance locus of both the Marksville phase and later Coles Creek phase due to the high artifact density and extensive subsurface deposits. While materials related to a third phase are present, their low frequency (n=1) does not suggest an extensive occupation. Additional examinations of the site would be necessary to delimit adequately all of the possible components.

LITHIC ARTIFACTS

16SL90. One chert biface was recovered at the Bayou Toulouse site. The biface is roughly triangular. Small patches of cortex are present on one face of the artifact. One corner of the biface appears to be part of the platform of the original flake from which the biface has been reduced. The biface displays no stylistic attributes which permit its association with a known temporal period. Detailed use-wear analysis of the edges of the artifact would be necessary to determine the function of this implement.

The lack of further prehistoric materials at this site suggest that it represents a locus for resource extraction. Its presence on point bar deposits associated with the Teche-Mississippi episode indicates an Archaic to contact temporal association.

16SL91. The Bertrand site contains the largest assemblage of lithic artifacts recovered during the survey. This includes two chert projectile points (identified as Edwards dart points after Williams and Brain 1983), six chert pebble fragments, three quartzite pebble fragments, and one siltstone pebble fragment. None of these pebble fragments display edge modifications which suggest use-wear. The quartzite and chert pebbles are all small (less than three centimeters in diameter). The siltstone pebble was considerably larger than the other fragments.

The paucity of cultural material at this site suggests a short-term occupation possibly related to resource extraction. Edwards dart points are associated with Marksville period occupations dating from approximately 200 B.C. to A.D. 400.

16SL94. One small chert flake was recovered from the Milburn site. This flake is approximately one centimeter in length. It has no cortex on its dorsal face and no visible edge damage. It possesses no stylistic attributes which would permit temporal or functional associations.

One piece of fire-cracked rock was recovered from the possible hearth encountered in Shovel Test 1 on Ray 0°. This specimen is a small portion of a quartzite pebble. In addition, one small piece of soft, limonitic material was found. This small pebble appears to be ocher. It was not discovered in direct association with other kinds of materials.

FAUNAL REMAINS

16SL94. The Milburn site produced twelve bone fragments. All were in association with the possible hearth encountered in Shovel Test 1 on Ray 0°. Eight of these fragments are from an ungulate, presumably white-tail deer (*Odocoileus virginianus*). Skeletal elements include one vertebra (two fragments), metapodials (one proximal end and one shaft fragment), and unidentifiable long bones (four fragments). One of the long bone fragments is burned. Another of these fragments has been polished on its exterior surface. Striations, presumably resulting from the polishing activity, are observable without magnification. Two fragments of turtle carapace (species unknown) and a single fragment of fish remains (species and element unknown) also were recovered. The final fragment in this assemblage was unidentifiable.

Historic Artifacts

As the preceding description of fieldwork has indicated, a small collection of nineteenth and early twentieth century artifacts was recovered during the survey of the Bayou Cocodrie and Tributaries project area. Laboratory analysis focused on chronological and functional parameters of site occupation, and on evaluation of the contextual integrity of remains. Artifacts were washed, labeled, and catalogued according to type. Ceramic artifacts were described utilizing a paradigmatic classification (Dunnell 1971:84) that is the product of the combination of unweighted classes of paste, glaze, and decorative type (Yakubik 1980). Glass artifacts were classified by technological and formal attributes. The classificatory schemes for both ceramics and glass utilized below have been discussed in detail elsewhere (Goodwin, Yakubik, and Gendel 1984). Metal and miscellaneous artifacts were identified whenever their condition permitted; these classes of artifacts received less formal classificatory attention than did the more time-sensitive artifact classes of ceramics and glass. Ceramic assemblages were dated using the Mean Ceramic Dating method (South 1977), as modified by Goodwin, Yakubik, and Gendel (1984). Discussions of the artifacts recovered during survey are presented below on a site by site basis.

16SL89. A single sherd of creamware was recovered from the Noel Slough site. The relatively white, thick paste of this sherd suggests that it probably was manufactured during the first two decades of the nineteenth century. No other historic artifacts were recovered from this site.

16SL90. Historic artifacts from the Bayou Toulouse site included ceramics, nails, and a carbon rod (Table 14). The two wire nails, the carbon rod, and the three sherds of decaled ironstone recovered form this site suggest that the majority of historic material was deposited during the twentieth century. However, one sherd of Rouen faience was recovered; this type dates to the mid to late eighteenth century. It is unlikely that these derived form a habitation in this area; very few artifacts were recovered, and no subsurface cultural remains were found. Instead, they probably represent secondary refuse deposited in the area that was subsequently spread through repeated cultivation of the land.

Seven bone fragments were recovered from this sites as well. All appear to be associated with the historic occupation. All are from a large ungulate, presumably cow. All fragments are portions of long bones. One piece exhibits a sawn end.

16SL91. A small collection of ceramics, glass, and metal was recovered form the Bertrand site (Table 15). Diagnostic artifacts included brownware (mid-nineteenth to early twentieth century), clear glass (twentieth century), and six very large (14.5 cm in length) nails (twentieth century). The nails undoubtedly derive from the oil well formerly located at this site; the remainder of the artifacts probably represent refuse deposited there while the well was active. The one possible exception is a large (2.5 cm in diameter) unglazed ceramic marble; this may have been lost rather than intentionally discarded. As was the case with the Milburn and Bayou Toulouse sites, the material at the Bertrand site has been spread by repeated cultivation of the fields.

16SL92. Only glass and ceramics were recovered from the LeBlanc #1 site; glass sherds represented over one-half (fifty-eight per cent) of the material collected (Table 16). A sufficient quantity (N=26) of ceramics were recovered to calculate the Mean Ceramic Date for the site; the resultant date was 1879.0. However, the presence of twentieth century glass and ceramic types, including clear glass, fragments of bottles manufactured by an automatic bottle machine, decaled ironstone, and silver gilded ironstone suggest that this date may be too early. The site is closely associated with the Leblanc #2 site (see below); ironstone sherds molded in similar patterns were found at both sites. The

Table 14. Historic Artifacts from the Bayou Toulouse Site.

Rouen faience	1
Whiteware/ironstone	1
Decaled ironstone	3
Wire nail	2
Carbon rod	1
Total	**8**

Table 15. Historic Artifacts from the Bertrand Site.

Brownware	2
Clear glass	5
Green glass	1
Green bottle base	1
Milk glass jar lid liner	1
Wire nail	6
Ceramic marble	1
Total	**17**

Table 16. Historic Artifacts from the LeBlanc #1 Site.

Whiteware/ironstone	11
Whiteware/ironstone, unglazed interior	4
Ironstone	6
Decaled ironstone	3
Ironstone, silver overglaze transfer-printed	1
Late spatter	1
Burnt ceramic	1
Brown glass	4
Brown bottle base, automatic bottle machine	1
Brown bottle top, screw top, automatic bottle machine	1
Clear glass	23
Clear bottle base	2
Clear bottle lip	1
Light green glass	1
Light green pane glass	2
Milk glass	2
Total	64

LeBlanc #1 site apparently was a dumping area for habitation refuse from the LeBlanc #2 site. Because the area has been repeatedly cultivated, the refuse at the LeBlanc #1 site has been spread horizontally subsequent to deposition.

16SL93. The LeBlanc #2 site yielded the largest collection of historic artifacts of any of the sites located during the survey (Table 17). The material consisted entirely of domestic refuse; the vast majority of the artifacts collected were glass (eighty-one per cent). However, sufficient numbers of ceramics were collected to calculate the Mean Ceramic Date for the site; the resultant date was 1893.7 (N=19). Like the MCD obtained for the LeBlanc #1 site, other diagnostic artifacts from the LeBlanc #2 site, especially the large amounts of clear glass and fragments of bottles with screw tops manufactured by an automatic bottle machine (Table 17), suggest that this date may be too early. Thus, materials from both the LeBlanc #1 and LeBlanc #2 sites may indicate the use of relict ceramic types. These early MCDs also may reflect the small ceramic samples from the two sites, as well as the limitations of utilizing Mean Ceramic Dating on primarily twentieth century collections lacking datable maker's marks.

Sixteen fragments of bone were recovered from the LeBlanc #2 as well. Fourteen of these fragments appear to be long bone fragments from a large ungulate, presumably cow. Six of these have been burned. The other two fragments are teeth. One of these specimens is from a cow. The other is from a smaller ungulate.

The presence of a small amount of architectural debris (bricks, drainage pipe, pane glass), large amounts of domestic refuse, and some faunal remains (n=16) including charred bone (n=6), all suggest that LeBlanc #2 may be a former habitation area, possibly from an early twentieth century farmstead. As noted in Chapter IV, tenant and sharecropper cabins were distributed throughout the agricultural fields in the parish from after the Civil War until shortly after World War II. As was the case with the remainder of the historic sites located during the survey, however, repeated cultivation of the LeBlanc #2 site area has impacted its contextual integrity.

16SL94. In addition to the prehistoric remains at the Milburn site, four historic period artifacts were recovered (Table 18). One sherd each of pearlware, brownware, and ironstone were collected. A clear pharmaceutical bottle neck with a tooled lip also was found. With the exception of the single pearlware sherd, which appears to have been manufactured during the first quarter of the twentieth century, the artifacts date from the late nineteenth century. As was the case with the Bayou Toulouse site, the materials from the Milburn site suggest secondary refuse deposited

Table 17. Historic Artifacts from the LeBlanc #2 Site.

	SW Quad	SE Quad	NW Quad	NE Quad	Total
Whiteware/ironstone		1			1
Ironstone			7	7	14
Decaled ironstone		1			1
Red banded ironstone				2	2
Pink glazed ironstone			1		1
English majolica				1	1
Porcelain			2		2
Blue glass				2	2
Brown glass			5	7	12
Brown bottle base, automatic bottle machine	1			3	4
Brown bottle neck, screw top, automatic bottle machine				2	2
Brown pharmaceutical bottle, screw top, automatic bottle machine			1		1
Brown bottle base			1		1
Clear glass	2	10	17	31	60
Clear pressed glass	1				1
Clear jar neck, screw top, automatic bottle machine	2				2
Clear pharmaceutical bottle neck, screw top, automatic bottle machine		1		2	3
Clear bottle neck, screw top, automatic bottle machine				3	3
Clear bottle neck, automatic bottle machine			2		2
Clear pharmaceutical bottle base, automatic bottle machine				2	2
Clear pharmaceutical bottle, automatic bottle machine			1		1
Clear paneled flask base			2		2
Clear paneled flask glass			1		1
Clear bottle base			1		1
Clear pane glass			2		2
Clear glass handle			1		1
Green glass		2	3	1	6
Green bottle base			1		1
Light green glass			1		1
Milk glass			1	1	2
Milk glass lid liner			1		1
Milk glass jar			1		1
Pressed milk glass plate			1		1
Brick/brick fragment	2	2			4
Ceramic drainage pipe				2	2
Total	**8**	**17**	**53**	**66**	**144**

Table 18. Historic Artifacts from the Milburn Site

Pearlware	1
Ironstone	1
Brownware, buff opaque glazed exterior, manganese glazed interior	1
Clear pharmaceutical bottle neck, tooled lip	1
Total	**4**

away from the main habitation area that was subsequently spread by cultivation.

16EV61. A small collection of ceramics and glass was obtained from the Mire Site (Table 19). The ceramics yielded a MCD of 1863.8 (n=20); however, the presence of late spatter in the ceramic collection suggests that this area was utilized for refuse disposal at least until the later nineteenth century. The paucity of artifacts and the absence of architectural debris suggest that this was a disposal area for habitation remains rather than an actual habitation site. As with all other historic sites located during survey, artifactual material at the Mire site had been spread horizontally by repeated cultivation of the area.

Summary

All historic artifacts recovered during the survey were collected from the surface of the sites; none of the sites exhibited subsurface deposits of historic remains. With the exceptions of the LeBlanc #2 site, which may have been a habitation area, and the Bertrand site, which evidently was associated with an oil well, the historic components at all other sites represented secondary habitation refuse disposal away from the actual living sites. It is likely that all these deposits were created between the end of the Civil War and shortly after World War II, when sharecropper and tenant residences were distributed throughout what formerly had been and subsequently became agricultural fields. However, since all of the sites lacked integrity, none are considered to possess further research potential.

Table 19. Historic Artifacts from the Mire Site.

Polychrome hand-painted pearlware	1
Whiteware/ironstone	13
Sponged whiteware/ ironstone	1
Sponged ironstone	1
Annular yelloware	1
Late spatter	2
Stoneware bottle	1
Porcelain	2
Clear glass	1
Dark green bottle neck, hand-blown, tooled lip	1
Light green milk bottle neck, melted	1
Slag	1
Total	**26**

CHAPTER VII

A COMPARISON OF SITE DISTRIBUTIONS IN THE PROJECT AREA

Using the data gathered during this survey, comparisons between the strata within the sampling universe can be made. These discussions will be presented in two parts. Initially, implications of the results of the survey with respect to effective cultural resource management will be discussed. Subsequently, discussions will focus on the more behavioral implications of the survey results with respect to the model of prehistoric land use described in Chapters II and III. These discussions of behavioral implications are limited, however, due to the low number of sites actually discovered. Efforts to overcome this lack of a sufficient number of sites will be attempted. Discussions concerning some of the factors which may have contributed to the low number of discovered sites will follow the comparisons.

Data Recovered During the Survey

Seven sites were discovered during the survey of five per cent of the wooded portions within the three-year flowline of the Bayou Cocodrie and Tributaries Project area. One of these sites (Noel Slough site, 16SL89) was outside the area selected for survey. It will not be included in the following discussions concerning estimated site distributions or densities. The remaining six sites represented six historic components and four prehistoric ones. The following discussions will consider this sample population of sites as a whole (i.e., representing six sites) and as smaller groups representing the temporal periods represented by the materials present at each site. The prehistoric and historic components represented at the six locales will be considered separately to assess the model of prehistoric land use described in Chapters II and III, and to address the expectations for historic sites discussed in Chapter IV.

Distributions by Reach

Site densities within each reach can be estimated from the survey data. These densities can be expressed in a number of ways to provide different aspects of this information. Three different expressions will be calculated and employed in the following discussions. These are: the number of sites per hectare (acre), the estimated total number of sites, and the number of hectares (acres) per one site. Each of these expressions are displayed in Table 20 for the distribution of all sites by reach.

Table 20. Estimated Site Densities by Reach.

Reach	Area: Total	Area: Surveyed	Sites Located	Density: Sites/ha	Density: 1 Site/ha	Density: Total
All Sites (Ha)						
K	3764	104	1	0.01	1/100	37
L	614	50	0	0.00	----	0
M	607	80	5	0.06	1/17	37
Prehistoric Sites (Ha)						
K			0	0.00	----	0
L			0	0.00	----	0
M			3	0.04	1/10	22
All Sites (Acres)						
K	9300	257	1	0.004	1/257	37
L	1517	124	0	0.00	----	0
M	1500	198	5	0.02	1/42	37
Prehistoric Sites (Acres)						
K			0	0.00	----	0
L			0	0.00	----	0
M			3	0.016	1/25	22

The number of sites per hectare (acre) can be used to describe the density of sites within each reach. These figures are calculated by dividing the number of discovered sites by the total number of hectares (acres) surveyed. Extremely low estimates are produced for all reaches. Reach K is expected to contain 0.01 sites per hectare (0.004 sites/acre), Reach L is expected to contain 0.00 sites per hectare/acre, and Reach M is expected to contain 0.06 sites per hectare (0.02 sites/acre). Therefore, Reach M is expected to have the highest density of archeological sites, followed by Reaches K and L, respectively.

The estimated total number of sites in the wooded portions within the three-year flowline per reach can be calculated by multiplying the ratio of sites per hectare by the total wooded area within the three-year flowline. These figures will provide a basis for the discussion of the effects of land clearance on the archeological resource base of the project area. The wooded areas in Reach K are expected to contain approximately thirty-seven archeological sites. In Reach L, similar areas are expected to contain no sites. Wooded areas in Reach M are expected to contain thirty-seven sites. The probability of a site being impacted by land clearance is related more to the density of these sites than to their absolute numbers given equal intensities of deforestation. The intensities of clearance may not be the same, however, especially in Reach L. Therefore, the total number of sites in conjunction with the estimated site densities will be employed to estimate the probable effects of land clearance on the archeological resource base within the Bayou Cocodrie and Tributaries Project area.

The third expression of site density is the estimation of the area associated with a single site. These figures can be derived from the estimated site densities for each reach. In Reach K, there is one site per approximately 100 hectares (247 acres) of woodland. No estimate of the area associated with a single site can be calculated for Reach L. In Reach M, there is one site per seventeen hectares (42 acres) of wooded area. These figures provide an estimate for the minimum sampling fractions necessary to cover adequately similar wooded areas. Further discussion of this aspect of the survey results will be presented below.

The failure to discover any sites within the sampled portion of the three-year flowline of Reach L is responsible for the lack of estimates or zero values noted for this reach. However, one site (16SL89) was discovered within this reach outside the randomly selected survey area. This implies that the sample may provide a poor estimator of the actual density of archeological sites within the reach. Efforts to overcome this weakness will be presented below. This weakness must be considered for any value estimates of zero for any of the reaches.

The nature of the kinds of materials expected to occur within the sites predicted to exist within each reach can be calculated also. There is a probability of 1.0 that any site discovered in Reach K will contain historic materials. None are expected to contain prehistoric materials. Any site discovered in Reach M is expected to represent a secondary refuse disposal area. Any site discovered within Reach M has a probability of 1.0 to contain a historic component as well. These sites have a probability of 0.8 to represent a secondary refuse disposal site; a probability of 0.2 exists for any site to represent a habitation site. There is a 0.6 probability that any site discovered in Reach M will contain a prehistoric component. No sites are expected to occur within Reach L.

If these probabilities are accepted as valid, one could expect thirty sites in Reach M to represent late nineteenth to early twentieth century secondary refuse disposal sites. The other seven sites would represent habitation sites. One could expect at least twenty-two of the sites in Reach M to contain prehistoric components. Estimates of prehistoric site density could be calculated as above. These densities would be 0.04 sites per hectare (0.016 sites/acre), twenty-two total sites, and one site per ten hectares (25 acres). These figures are displayed in Table 20. No sites containing prehistoric components are expected to exist in Reaches K and L. As stated above, however, zero values are considered poor estimates of the actual contents or densities of sites. A similar caveat must be applied also to the high probabilities (i.e., 1.0) described for all reaches. While such values are observed, they represent absolute statements (i.e., there is no chance an event will occur or it will occur in all attempts). Probabilistic statements should not convey such absolute results (Blalock 1972:116-120).

Factors which explain the increased number of sites expected in Reach M are threefold. Reach M contains the greatest amounts of abandoned course and point bar deposits of any of the reaches. These geomorphological strata are expected to display the greatest potential for attracting prehistoric groups. Some of these same attributes (i.e., well-drained soils, higher relative elevations, access to watercourses) would have attracted historic groups as well. This would suggest that Reach M has a high potential for containing numerous archeological sites. In addition, Reach M lies between the three largest towns within the project area, namely Opelousas, Port Barre, and Washington, Louisiana. These towns all represent fairly old settlements within the region. A greater amount of historic activities may be predicted due to this proximity to these long-term centers of population. The third factor is the proximity of the reach to the Quaternary Prairie Terrace to the west. This feature offers one of the two major physiographic zones near the project area (i.e., the terrace and the alluvial floodplain). As stated above, this upland terrace is expected to provide access to many of the terrestrial resources attractive to prehistoric groups plus many of the logistical attributes favorable to the establishment of prehistoric maintenance sites. Historic emphasis on the upland portions of the region are also noted above. Prehistoric and historic sites may have been located in Reach M to take advantage of the resources and attributes available within these two distinct regions.

Two of the factors suggested above for influencing site densities are operative in Reach L as well. These are the presence of portions of all of the geomorphic strata and the proximity of the towns of Port Barre and Washington. These two factors would contribute to the potential of the reach for attracting human activities. The smaller areas within the strata and its greater distance from the Quaternary Prairie Terrace would have mitigated against densities which approximate those estimated for Reach M. This potential is not reflected, however, in the sampled portion of this reach. The presence of at least one site, containing both a historic and a prehistoric component, suggests that the sample may not provide a valid estimate of the density of sites within the reach.

Reach K displays fewer of these factors than the other two reaches. In fact, only its proximity to the Quaternary Prairie Terrace could be considered as an enhancing attribute. It should be kept in mind, however, that this reach received the least amount of survey coverage in terms of sample fractions. It contains the greatest amount of extant woodland, both relative and absolute, of any of the reaches. Since these factors relate to the efficiency of the survey, they will be discussed further in a subsequent section of this chapter.

Distributions by Geomorphic Stratum

Analysis of site distributions with respect to the geomorphological strata will be presented as above. Discussions of all sites within each stratum will be followed by discussions of prehistoric sites only. Since all sites discovered during the sample survey contain historic components, the initial discussions will represent the distribution of historic components within the strata as well as the distribution of all sites. The emphasis given to prehistoric sites in the following discussions reflects the model generated in Chapters II and III for prehistoric utilization of the alluvial floodplain.

Employing the Survey Data

The expressions of estimated site density for each of the geomorphological strata (i.e., abandoned channel, abandoned course, point bar, and backswamp) for all sites are displayed in

Table 21. The abandoned course stratum displays the highest density of all sites (0.25 sites per hectare or 0.10 sites per acre). In order of their descending ranks, the other strata are point bar (0.02 sites per hectare or 0.008 sites per acre), backswamp (0.014 sites per hectare or 0.006 sites per acre), and abandoned channel (0.00 sites per hectare/acre). Possible factors contributing to these overall distributions will be presented below.

The total number of sites expected within each of the strata are nineteen in the abandoned course stratum, fourteen within the point bar stratum, 57 within the backswamp, and none in the abandoned channel stratum. The number of sites expected for the abandoned channel stratum is considered a weak estimate due to the failure of the survey to discover any sites in this stratum. While site densities were expected to be low, the total lack of sites within the stratum was not anticipated.

Within the abandoned course stratum, one site is expected per every four hectares (10 acres). For the point bar stratum, one site is expected per every 54 hectares (133 acres). One site per 71 hectares (183 acres) is expected within the backswamp stratum. No such estimates could be calculated for the abandoned channel stratum.

The nature of the materials expected to exist at all of the sites within each stratum can be predicted also. Any site discovered within the abandoned course, point bar, or backswamp strata have a probability of 1.0 for containing historic components. No historic sites or components are predicted for the abandoned channel stratum. Within the abandoned course stratum, there is a probability of 0.33 that any site will contain a prehistoric component. Within the point bar stratum, there is a probability of 1.0 that any site will contain a prehistoric component. There is a probability of 0.5 that any site discovered within the backswamp stratum will contain prehistoric component. No prehistoric sites or components are expected within the abandoned channel stratum.

If the observed distributions of sites are valid, one would expect 83 per cent of all historic sites to represent secondary refuse disposal areas. The remaining seventeen per cent would represent habitation sites. This implies that sixteen refuse disposal sites and three habitation sites would be expected in the abandoned course stratum. All sites in the point bar and backswamp strata would be expected to represent refuse disposal areas. No sites are expected in the abandoned channel stratum.

If these probabilities are accepted, the distributions of prehistoric sites among the strata can be estimated. The total

Table 21. Estimated Site Densities by Geomorphological Stratum.

All Sites (Ha)

Stratum	Area		Sites Located	Density		
	Total	Surveyed		Sites/ha	1 Site/ha	Total
Abandoned channel	125	20	0	0.00	----	0
Abandoned course	75	12	3	0.25	1/4	19
Point bar	695	54	1	0.02	1/54	14
Backswamp	4090	148	2	0.014	1/71	57

Prehistoric Sites (Ha)

Stratum	Sites Located	Sites/ha	1 Site/ha	Total
Abandoned channel	0	0.00	----	0
Abandoned course	1	0.08	1/12	6
Point bar	1	0.02	1/54	14
Backswamp	1	0.007	1/148	29

Table 21, continued.

All Sites (Acres)

Stratum	Area: Total	Area: Surveyed	Sites Located	Density: Sites/ha	Density: 1 Site/ha	Density: Total
Abandoned channel	309	49	0	0.00	----	0
Abandoned course	185	30	3	0.10	1/10	19
Point bar	1717	133	1	0.008	1/133	14
Backswamp	10102	366	2	0.006	1/183	57

Prehistoric Sites (Acres)

Stratum	Area: Total	Area: Surveyed	Sites Located	Density: Sites/ha	Density: 1 Site/ha	Density: Total
Abandoned channel			0	0.00	----	0
Abandoned course			2	0.03	1/30	6
Point Bar			1	0.008	1/133	14
Backswamp			1	0.003	1/366	29

number of sites expected within the abandoned course stratum is six (0.08 sites/hectare or 0.03 sites/acre, one site per twelve hectares or 30 acres). Within the point bar stratum, fourteen prehistoric sites are expected to exist (0.02 sites/hectare or 0.008 sites/acre, one site per 54 hectares or 133 acres). Twenty-nine prehistoric sites are expected to exist within the backswamp stratum (0.007 sites/hectare or 0.003 sites/acre, one site per 148 hectares or 366 acres). No prehistoric sites are predicted to occur within the abandoned channel stratum. These figures are also displayed in Table 21.

These densities are assumed to reflect the attributes identified for these strata. Abandoned courses were predicted to provide access to multiple food resources, multiple raw materials, and many logistical attributes. High densities of prehistoric sites were expected for this stratum. The point bar stratum contained the next highest concentration of favorable attributes (terrestrial food resources and raw materials and some logistical attributes). Densities approximating those within the abandoned course stratum were expected for this stratum. Backswamp areas were expected to provide access to terrestrial and aquatic food resources and raw materials. Lower site densities were expected in the areas identified as backswamp. Abandoned channels provided the most limited array of favorable attributes (primarily, aquatic food resources and raw materials). This stratum was expected to display the lowest density of prehistoric archeological sites.

If the prehistoric sites are separated into extraction and maintenance loci, the strata do not display the differences predicted in Chapter III. Two of the three components can be described as extraction sites. These are 16SL90 (containing one biface) and 16SL91 (containing two Edwards dart projectile points and ten other lithic artifacts). The other site (16SL94) appears to be a maintenance locus due to the high artifact density and the presence of intact subsurface deposits. The extraction loci occur on the abandoned course and point bar deposits. The maintenance site occurs in the backswamp stratum but, on a local "high point". The distributions of the extraction loci are similar to those expected for these strata. These sites are assumed to represent exploitation of terrestrial food resources and raw material. The presence of a maintenance site in the backswamp strata does not conform to the expectations outlined in Chapter III. It should be noted, however, that site locations were expected to be related to extremely local factors within this stratum. The Milburn site (16SL94), containing Marksville, Troyville, and Coles Creek components, is located in an area of extremely silty to sandy soils. These soils have the most coarse texture of any observed in the project area. It occupies a small rise or mound which appears to have been enhanced by the human occupants. Thus, several of the logistical attributes which have been identified as encouraging the placement of maintenance sites are present at this locale. These local attributes are assumed to have influenced the placement of this maintenance site.

The final analyses employing the survey data examine the relationship between the temporal periods represented at the prehistoric sites and depositional episodes responsible for the deposits on which they lie. Two of the sites can be assigned to distinct temporal phases (16SL91 and 16SL94). The remaining site (16SL90) cannot be associated with any known prehistoric phase or period. It could represent an occupation from the Archaic period to the protohistoric period.

The oldest identified components discovered during the survey are Marksville. The Bertrand site (16SL91) represents a Marksville resource extraction site (as evidenced by the presence of two Edwards Dart projectile points). The earliest identified component at the Milburn site (16SL94) represents a Marksville maintenance site (as evidenced by a number of ceramic types and the density and diversity of artifact types). The former site lies along an abandoned course associated with the Teche-Mississippi episode of deposition. The latter site lies in the backswamp associated with either the Teche-Mississippi episode or the Wauksha-Red episode.

The active period for the Teche-Mississippi episode is 6,000 to 4,600 years B.P. or between approximately 4,000 and 2,600 B.C. The Marksville period is dated to the period between approximately 200 B.C. and A.D. 400. These periods do not overlap. Given the data recovered during this survey, the association of Marksville period sites to an active period of deposition is not possible. These sites appear to be associated with relict watercourses. If the backswamp containing the Milburn site (16SL94) is associated with the Wauksha-Red episode, the active period is still too early to include any Marksville occupations (5,400 to 3,900 B.P. or 3,400 to 1,900 B.C.). Therefore, an association appears to exist between Marksville period sites and relict watercourses, given the data employed. This relationship of prehistoric occupations with relict drainages will be discussed further below.

The other site which can be associated with a known temporal phase is the Coles Creek component identified at the Milburn site (16SL94). This site lies in a backswamp area associated with either the Teche-Mississippi or Wauksha-Red episodes of deposition. Neither of these episodes overlap with the known temporal extent of Coles Creek occupations (A.D. 700 to 1,200). Therefore, given the data generated by this survey, Coles Creek period sites are assumed to be associated with relict watercourses.

The third prehistoric site discovered during the survey does not contain any diagnostic materials. The Bayou Toulouse site (16SL90) contained a single chert biface. The site lies on point bar deposits associated with the Teche-Mississippi episode of deposition. This association would delimit the earliest possible occupation of the site as Middle to Late Archaic. Given the above hypothesized association of Middle and Late Woodland occupations with relict watercourses, this site could represent an occupation during either of these periods as well. Further speculation concerning the temporal association of the Bayou Toulouse site is pointless.

The other site discovered during the survey, but not included in any of the preceding discussions since it was outside the sampled area, is the Noel Slough site (16SL89). It can be associated with a Middle to Late Woodland occupation. The site contains ceramics identified as Baytown Plain var. unspecified. These ceramics could represent a Marksville, Troyville, or Coles Creek occupation. The site lies on abandoned course deposits associated with the Teche-Mississippi episode of deposition. This period precedes all of the possible phases represented by the ceramics at the site (Marksville 200 B.C.-A.D. 400, Troyville A.D. 400-700, Coles Creek A.D. 700-1,200). Therefore, all of the Middle and Late Woodland occupations discovered during this survey, whether within or outside the sampled area, are associated with relict watercourses.

Using the Stratum Densities to Estimate Densities for the Reaches

It is possible to estimate the number of sites, both historic and prehistoric, which should exist within the wooded portions in the three-year flowline of Reaches K, L, and M. The total area of each geomorphological stratum (abandoned channel, abandoned course, point bar, and backswamp) within each reach can be multiplied by the expected site densities for each stratum to provide an estimate of the total number of sites that should exist within a particular reach. This will provide one way to overcome the weak estimators created by the lack of discovered sites in Reach L.

Table 22 displays the densities and expected total number of sites per reach as extrapolated from the estimated site densities for the geomorphological strata. Reach K displays a slightly higher density of sites than was evident from the survey data within the reach (0.014 sites/ha or 0.006 sites/acre, one site/71 ha or 175 acres, 51 total sites). Reach L displays a density of 0.03 sites per hectare (0.01 sites/acre, one site/33 ha or 82 acres, 18 total sites). No density values could be estimated for this reach given the survey data. Reach M displays a lower density

Table 22. Revised Site Densities and Total Number of Prehistoric Sites in Reaches K, L, and M.

All Sites (ha)

Reach		K		L		M	
Stratum	Estimated Site Density	Area	Total Sites	Area	Total Sites	Area	Total Sites
Abandoned channel	0.00	110	0	15	0	0	0
Abandoned course	0.25	0	0	30	8	45	11
Point Bar	0.02	0	0	290	6	405	8
Backswamp	0.014	3654	51	279	4	157	2
Total		3764	51	614	18	607	21
Density			0.014		0.03		0.03

Prehistoric Sites

Stratum	Estimated Site Density	K Total Sites	L Total Sites	M Total Sites
Abandoned channel	0.00	0	0	0
Abandoned course	0.08	0	2	4
Point Bar	0.02	0	6	8
Backswamp	0.007	26	2	1
Total		26	10	13
Density		0.007	0.016	0.02

Table 22, continued.

All Sites (acres)

Reach		K		L		M	
Stratum	Estimated Site Density	Area	Total Sites	Area	Total Sites	Area	Total Sites
Abandoned channel	0.00	273	0	37	0	0	0
Abandoned course	0.10	0	0	74	8	111	11
Point Bar	0.008	0	0	716	6	1001	8
Backswamp	0.006	9027	51	690	4	388	2
Total		9300	51	1517	18	1500	21
Density			0.006		0.01		0.014

Prehistoric Sites (acres)

Stratum	Estimated Site Density	K Total Sites	L Total Sites	M Total Sites
Abandoned channel	0.00	0	0	0
Abandoned course	0.03	0	2	4
Point Bar	0.008	0	6	8
Backswamp	0.003	26	2	1
Total		26	10	13
Density		0.003	0.006	0.008

of sites than was estimated from the survey data within the reach (0.03 sites/ha or 0.01 sites/acre, one site/33 ha or 82 acres, 21 total sites).

The density of prehistoric sites within Reach M displays a similar magnitude of difference between the value generated for the reach above (Table 20) and from the density values derived from the geomorphic strata (Table 22). The new density values for prehistoric sites in Reach M are 0.02 sites per hectare (0.008 sites/acre, one site/50 ha or 123 acres) and 21 total sites with prehistoric components. Density values for prehistoric sites in Reaches K and L can be calculated. These values are 0.007 sites per hectare for Reach K (0.003 sites/acre, one site/143 ha or 353 acres, 26 total sites) and 0.016 sites per hectare for Reach L (0.006 sites/acre, one site/63 ha or 156 acres, 10 total sites).

Reach M has a lower estimated density of sites given the areas of the geomorphological strata within the reach. This suggests that other factors contribute to the observed site densities besides the attributes defined for the geomorphological strata. These include the varying sampling fractions within the geomorphic strata and the reaches or certain behavioral characteristics related to the geomorphic components of the reaches. If varying sampling fractions within the strata are responsible, the differences between observed site densities and those predicted from the geomorphological strata within Reach M can be explained as sampling error.

If sampling error is not responsible for the differences, then proximity to the Quaternary Prairie Terrace plus plus the proximity to the major historic centers of population may be possible factors influencing site locations. Reach M is bounded to the west by the terrace. It is bounded to the northwest by Washington and Opelousas and to the northeast by Port Barre. Additional data and further analyses would be necessary to address this possible relationship or to define adequately other relevant factors which may contribute to the higher observed site densities in Reach M.

This exercise has provided an assessment of the estimated site densities by geomorphic stratum. It suggests that additional factors have influenced the locations of prehistoric and historic sites. In addition, different sampling fractions within the reaches and geomorphic strata may have contributed to the differences between the two sets of density values (Stone 1981). Further analyses to define these factors would require data not available through the present study. Since the new estimated density values for Reaches K and M approximate those defined through the observed site frequencies, the use of the four geomorphological strata provides a reasonably accurate estimate of site densities within selected areas of the Bayou Cocodrie and Tributaries Project. Applications in different portions of the lower Mississippi Valley would be necessary to assess the applicability of these strata to all alluvial bottomlands.

Factors Affecting the Results of the Survey

The discussions of prehistoric site densities and distributions within the reaches and the geomorphological strata have been based upon the results of the probabilistic survey carried out during this study. The survey results are assumed to be an accurate representation of actual prehistoric site distributions and densities within the reaches. There are a number of factors which may affect these results, and thereby reduce their ability to reflect adequately real site densities or distributions. These factors will be discussed briefly with attention given to efforts which help to alleviate their possible effects. Some of these efforts have been employed above. Others are presented for consideration by researchers who may attempt studies in similar regions in the future.

These factors relate to the efficiency of the sampling design and survey program employed in the present study. Two weaknesses with this strategy have been identified in Chapter V. These are the small size of two of the geomorphological strata (i.e., abandoned channel and abandoned course) and the unknown relationship between past human activities and the geomorphological strata. Theoretical discussions of the attributes available within the strata and comparisons to data drawn from previous studies suggest that the strata do provide a reasonable approximation of prehistoric land use as evidenced through site distributions and densities. Small sample sizes for two of the strata have been addressed by increasing the sampling fractions within these strata, employing a sample unit of smaller size in these strata, and dispersing these sample units over all available woodlots. Hopefully, these efforts have overcome these problems.

Additional aspects of the survey program which should be addressed include the ability of the techniques employed to discover sites within the project area. This aspect of the efficiency of the survey is related to the size of archeological sites anticipated within the area surveyed and the expected densities of artifacts within these sites (Lightfoot 1986; Lovis 1976; Lynch 1980; Nance 1979; Nance and Ball 1986). These variables create probabilities for the discovery of sites given the subsurface sampling regime employed during the survey. The transect widths and shovel tests intervals specified in the Scope of Services (Appendix I) represent an attempt to optimize the areal coverage of the project area and the amount of time necessary to obtain the desired coverage (i.e., 5 per cent). If possible, such regimes should consider the minimum areal extent and artifact densities expected to exist at sites within a survey area (cf. Lovis 1976).

Following Lovis (1976:371), an assessment of the transect and shovel test intervals can be attempted. These intervals should be able to intersect, with at least one shovel test, the minimum linear dimension of most sites expected to exist within a surveyed area in order for the sampling strategy to possess a reasonably high probability for the discovery of a site. The mean of the minimum linear dimension of nineteen sites within the project area has been calculated (Table 23). The sites include the seven sites discovered during this survey (16SL89, 16SL90, 16SL91, 16SL92, 16SL93, 16SL94, and 16EV61) and twelve sites reported by Goodwin et al. 1986 (16SL75, 16SL76, 16SL77, 16SL78, 16SL79, 16SL81, 16SL82, 16SL83, 16SL85, 16SL86, 16SL87, and 16SL88). Two sites reported by Goodwin et al. (1986), 16SL80 and 16SL84, are not included since they represent wharf pilings and bridge or road components, respectively. With a mean of 60.579 meters (s= 43.368), the probability of intersecting a site of average size with more than a single shovel test along a transect within a sample unit is low. In fact, only four sites have minimum linear dimensions greater than the shovel test intervals. All other sites have values less than the mean. This implies that a smaller interval between shovel tests along a transect within a sample unit may have been more effective for the discovery of sites (Lovis 1976; Nance 1979).

As an example, thirteen sites possess minimum linear dimensions greater than or equal to 50 meters. Use of a 50 meter increment between shovel tests would have created a much greater chance of discovering sites with a mean minimum linear dimension of 60.579 meters. This value represents the mode of the observed distributions of minimum linear dimensions of the sites displayed in Table 23. Nance (1979:175) suggests that modal values may be more helpful as a guide to shovel testing increments than mean values. The use of a 50 meter shovel test interval would have doubled the amount of time necessary to survey one sample unit. Such an increase in time would have reduced the amount of time available to examine the project area, thereby reducing the total area which could be surveyed within the project area. Possibly, this problem could have been overcome by adjusting the transect widths within a sample unit. The twenty meter transect interval with a 100 meter increment between shovel tests along each a transect within sample units provided an optimal solution for the time and cost parameters of the project. Future investigators in similar regions may wish to consider a smaller interval between shovel tests than the 100 meter increment employed in this survey.

Table 23. Minimum Linear Dimensions of Elected Sites in the Project Area.

Site	Minimum Dimension (m)
16SL75	50
16SL76	100
16SL77*	60
16SL78*	40
16SL79	50
16SL81*	200
16SL82*	100
16SL83	60
16SL85*	60
16SL86	60
16SL87*	50
16SL88	50
16SL89*	10
16SL90*	25
16SL91*	16
16SL92	20
16SL93	50
16SL94	110
16EV61	40

Mean = 61 m S = 43
Median = 105 m Mode = 50 m
Range = 10 m to 200 m (190 m)

*Contains prehistoric materials.

Given that all of the sites discovered during this survey were in cleared portions of the sample units supports the implications of the above discussion. The possible inadequacy of the sampling program must be considered in all of the discussions of site densities presented above and in all of the discussions of possible impacts based upon these density values presented in Chapter VIII. The discrepancies noted between the density estimates for Reach M employing area surveyed within the reach and the proportional amounts of each of the geomorphic strata may reflect the failure of the sample to reflect adequately the actual population of sites within the project area. The failure to discover any sites within the surveyed portions of Reach L and the discovery of only one site in the surveyed portions of Reach K may be an artifact of poor representation by the sample rather than the result of human decision-making as implied through the models of land use presented above. As stated above, however, the low sampling fraction for Reach K (2.8 per cent) may also be a factor for the low densities of sites observed within this reach (Stone 1981).

These possible inadequacies are compounded further if one considers the dichotomy between prehistoric sites employed in the model of prehistoric land use presented in Chapters II and III. Two kinds of sites are predicted to exist: resource extraction sites and maintenance sites. Resource extraction sites are expected to be small with low densities of artifacts. Maintenance sites are expected to be much larger with significantly higher densities of artifacts. Using any sampling strategy, maintenance sites should possess a higher probability for discovery than resource extraction sites (Nance and Ball 1986:479). The shovel test interval employed in the present study could reduce the probability of discovering resource extraction sites below an acceptable level. Thus, the sampling program may not be able to discover a particular component of the prehistoric archeological resource base. This certainly would detract from the efficiency of the program with respect to prehistoric sites. Such an inadequacy may be reflected in the failure of the survey to discover any prehistoric resources in Reach K.

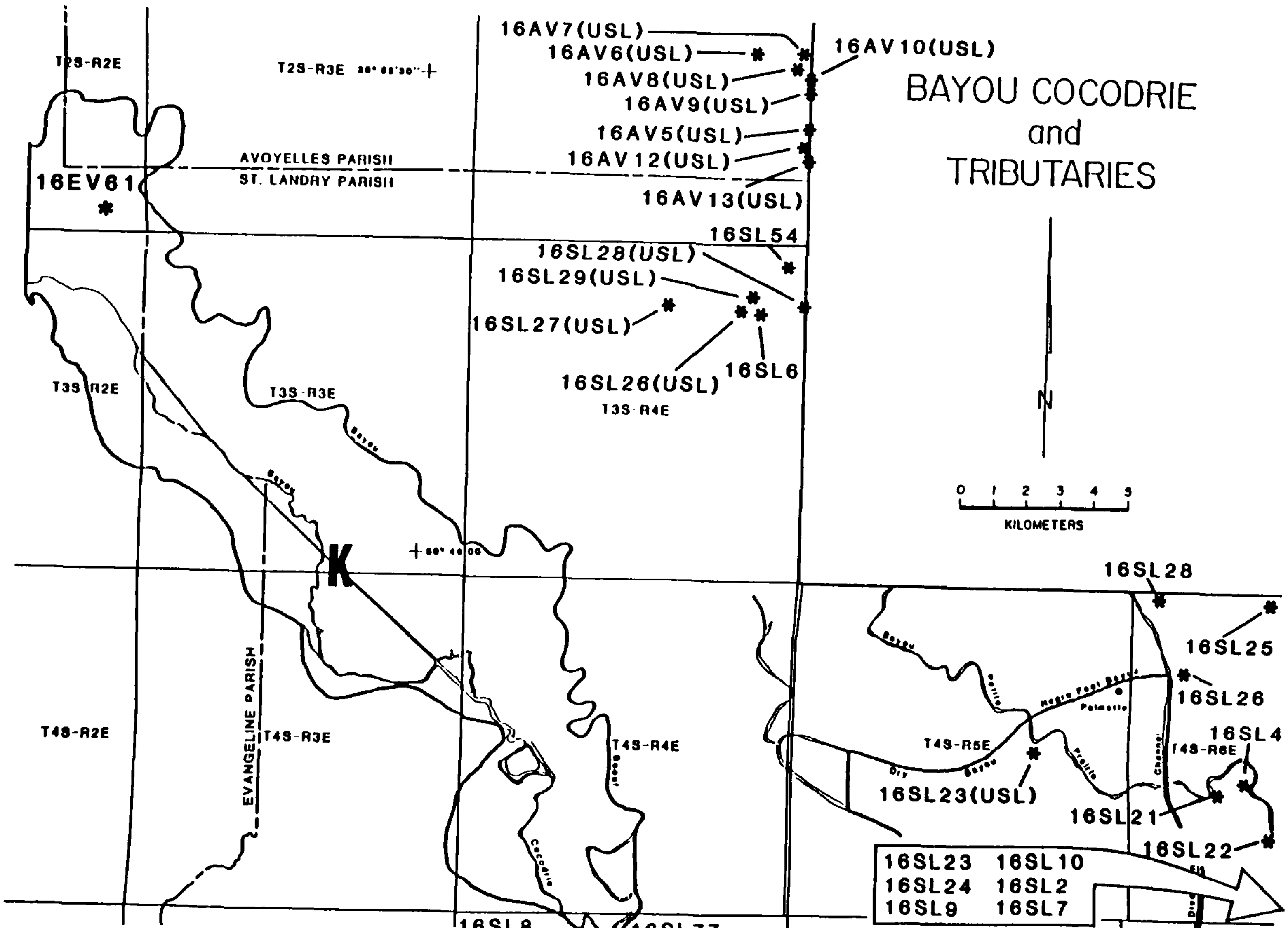
As discussed above, several factors have been noted which could affect the results of the survey. Earlier discussions noted the possible inadequacies in the sampling program indicated by the extremely high or low probabilities (i.e., 1.0 or 0.0) observed for the presence of sites or certain types of sites within Reaches K and L, and the discrepancies noted between the density values derived from two different sources for each reach. The effects of this possible inadequacy could be determined through additional survey efforts. Until such efforts are forthcoming, however, these values must be accepted as valid. Therefore, all subsequent discussions will present the density estimates as valid representations of the population of archeological sites within the project area. Estimates derived from the expected numbers of sites per geomorphic stratum will be employed for the reaches rather than the observed density of sites. These estimates are considered to be more reliable than those observed within the reaches since the sampling program employed the geomorphic strata as the sample populations rather than the reaches.

Comparisons with Other Data

While the survey results provide an assessment of the distribution of archeological sites within the project area, comparisons with data from previous surveys will permit the development of a more regional perspective for these relationships. The additional site information has been drawn from Gagliano et al. (1978) and Goodwin et al. (1986). These sources provide map locations and temporal associations for forty-seven sites in Avoyelles and St. Landry Parishes. Gagliano et al. (1978:62) provide associations between known sites and relict geomorphological features. These associations have been verified or modified by replotting the sites on the maps of geomorphological features employed to define the strata in this study (USACE 1982). Site locations from Goodwin et al. (1986) have been transferred to these same maps. Figure 16 displays the locations of all these sites with respect to the Bayou Cocodrie and Tributaries Project area.

These comparisons will attempt to support the projected densities of sites defined above and the hypothesized attraction for Middle and Late Woodland occupations to relict watercourses. Unfortunately, the specific areas surveyed to locate all of the sites displayed in Figure 16 are unknown. Therefore, the total area of the five features which contain prehistoric sites were estimated using planimeter measurements from the Palmetto, Opelousas, and portions of the Bunkie 15 minute quadrangles which display the surficial geology of the area (USACE 1982). It should be understood that all of the estimates of site density will reflect where archeological surveys have been conducted, the relative areas of the geomorphic strata, and prehistoric settlement patterning. The error created by the first two factors is accepted to permit comparisons between the data generated through the present study and previous investigations.

In terms of location within a particular geomorphological stratum, multi-component sites are counted only once. While such sites were counted as two or more sites in some of the preceding discussions, the data from Gagliano et al. (1978) indicated only the initial occupation of each site. Counting known multi-component sites as one location makes all site data more compatible. With respect to the relationship of sites to active or relict drainages, all known components from sites have been


BAYOU COCODRIE
and
TRIBUTARIES
N
0 1 2 3 4 5
KILOMETERS
16AV7(USL)
16AV6(USL)
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16AV9(USL)
16AV5(USL)
16AV12(USL)
16AV13(USL)
16AV10(USL)
16SL54
16SL28(USL)
16SL29(USL)
16SL27(USL)
16SL26(USL)
16SL6
16EV61
AVOYELLES PARISH
ST. LANDRY PARISH
EVANGELINE PARISH
T2S-R2E
T2S-R3E
T3S-R2E
T3S-R3E
T3S-R4E
T4S-R2E
T4S-R3E
T4S-R4E
T4S-R5E
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Cocodrie
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16SL9 16SL7

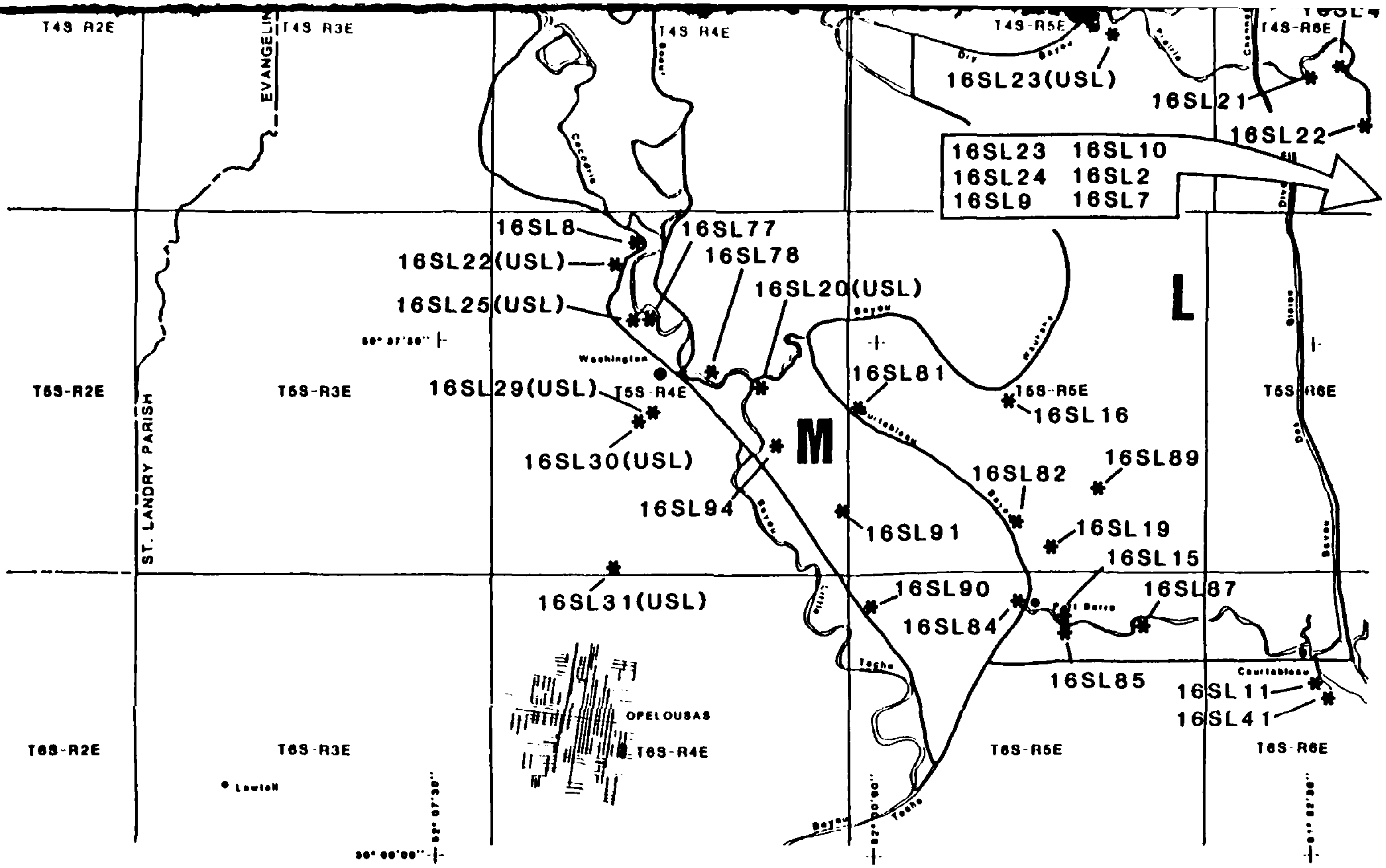

Figure 16. Location of known sites in or near the project area.

employed in the individual discussions of the relevant temporal phases.

The number of all sites located within a particular stratum are displayed in Table 24. The frequencies are displayed with respect to their particular sources as well. From these data, the total number of sites per feature demonstrate that abandoned course deposits contain the highest frequency of prehistoric archeological sites (n=15). The other features can be ranked below the abandoned course with respect to total known sites. In descending order, this ranking is backswamp (n=12), point bar (n=11) and prairie terrace (n=11), and abandoned channel (n=2).

The total area of each feature and site densities are displayed in Table 25. The area for each geomorphic feature has been derived by planimeter measurement of the features on the USACE (1982) geological maps which include the survey area. Features which extend off the map boundaries have been limited to those townships which contain archeological sites. Abandoned course deposits display the highest density (0.0015 sites per hectare). In descending order, the other features display the following densities: abandoned channel (0.0012 sites per hectare), point bar (0.0003 sites per hectare), backswamp (0.0002 sites per hectare), and prairie terrace (0.0002 sites per hectare). With the exception of the abandoned channel stratum, this ranking reflects the expected densities for sites developed in Chapter III and the densities generated from the survey data. Higher densities were expected for the Quaternary Prairie Terrace; however, values similar to the point bar deposits are acceptable. The unexpected high density for abandoned channel deposits partially reflects the small total area of this feature within the greater region. Any sites within this small area would create a high density value. As stated in Chapter III, this also may be a reflection of the inability of the model to address adequately the association of sites with abandoned channels if such activity loci are present at the periphery of these features. The extremely low values for all features are assumed to reflect the use of the total area of all features in estimating site densities. The caveat stated at the outset of this discussion notwithstanding, these densities reflect the relative relationships between the density values estimated from the data generated through this survey. Therefore, the distributions of sites among the geomorphological features defined in this study, with the possible exception of the abandoned channel stratum, can be accepted as valid representations of site distributions in the region.

With respect to temporal periods and their relationships to active and relict courses, thirty-nine of the fifty-one sites employed in the previous comparisons were separated by their known components. The remaining twelve sites did not contain

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Table 24. The Distribution of Known Sites among the Five Geomorphic Features.

Feature	From Gagliano et al. 1978	From Goodwin et al. 1986	Present Study	Total
Abandoned channel	2	0	0	2
Abandoned course	9	4	2	15
Point Bar	7	3	1	11
Backswamp	11	0	1	12
Prairie Terrace	11	0	0	11
Total	40	7	4	51

Table 25. Area and Site Densities Within the Five Geomorphic Features.

Feature	Total Area (Hectares)	Total Sites	Site Density
Abandoned channel	1,699	2	0.0012
Abandoned course	10,124	15	0.0015
Point Bar	34,989	11	0.0003
Backswamp	69,995	12	0.0002
Prairie Terrace	48,176	11	0.0002

diagnostic materials, thereby preventing their association with a known phase of occupation. The thirty-nine identified sites were associated with the particular depositional episode responsible for the feature on which the site lies. The summary of these assignments and associations are displayed in Table 26.

With the exception of the Paleo-Indian and Archaic sites, the majority of all sites are associated with relict depositional episodes. That is, few sites occur on features or in association with features which represent contemporary active fluvial episodes. This is especially evident for sites associated with Coles Creek and Plaquemine/Mississippian components (82 per cent and 83 per cent associated with relict drainages respectively). While the same appears true for the earlier Marksville and Troyville components, small sample sizes (n= 4 and n= 5, respectively) prohibit more positive statements related to this predilection. Table 27 provides a summary of the associations with relict and active drainages for all identified prehistoric periods or phases.

Some of the associations between relict watercourses and sites displayed in Table 26 involve channels which were reoccupied by later fluvial episodes. If the location of these sites is related to the later period of deposition, the interpretation of prehistoric orientations towards relict drainages must be modified. Fifty per cent of the known Marksville sites may be associated with active drainages if the Boeuf-Red reoccupation of the Teche-Mississippi was active during the occupations of 16SL91 and 16SL94. Forty-six per cent of the Coles Creek sites may be associated with active drainages associated with Boeuf-Red reoccupations of Teche-Mississippi channels. Forty-three per cent of the Mississippi period sites would be associated with an active fluvial episode. This would suggest that attractions to active or relict watercourses were immaterial to the location of archeological sites during the later Woodland and Mississippi periods. More intensive and extensive examinations of the existing site data and the specific locations of these sites would be necessary to determine which possibility is more likely. Until the results of such investigations are forthcoming, the association with relict watercourses during these periods remains a valid observation.

The results of these comparisons support the hypothesized selection of relict watercourses as site locations by prehistoric populations presented above. This emphasis on relict features and watercourses is assumed to be related to the nature of resource exploitation by the human groups occupying the alluvial floodplain. Gagliano et al. (1978:67) hypothesized that sites occurring on relict drainages implied that the watercourses remained active after the abandonment of a meander belt by the

Table 26. Associations of Identified Archeological Components with Past Depositional Episodes and Features.

Period/Phase	Sites	Episode	Feature
Paleo-Indian	16AV6 (USL)	Quaternary Prairie Terrace	Prairie Terrace
	16AV7 (USL)	Quaternary Prairie Terrace	Prairie Terrace
Archaic	16AV5 (USL)	Early Teche-Mississippi	Abandoned channel
	16AV9 (USL)	Quaternary Prairie Terrace	Prairie Terrace
	16AV12 (USL)	Early Teche-Mississippi	Point Bar
	16AV13 (USL)	Early Teche-Mississippi	Point Bar
	16SL16	Teche-Mississippi	Point Bar
	16SL19	Teche-Mississippi	Point Bar
Poverty Point	No sites		
Tchula/Tchefuncte	16SL23 (USL)	Teche-Mississippi and Petite Prairie-Red	Abandoned course
Marksville	16SL28 (USL)	Early Teche-Mississippi	Abandoned channel
	16SL8	Quaternary Prairie Terrace	Prairie Terrace
	16SL91	Teche-Mississippi*	Abandoned course
	16SL94	Teche-Mississippi*	Backswamp
Troyville	16SL7	Petite Prairie-Red	Point Bar
	16SL24	Petite Prairie-Red	Abandoned course
	16SL78	Boeuf-Red	Point Bar
	16SL82	Teche-Mississippi	Abandoned course
	16SL89	Teche-Mississippi	Abandoned course

Table 26 continued:

Period/Phase	Sites	Episode	Feature
Coles Creek	16SL4	Petite Prairie-Red	Abandoned course
	16SL9	Petite Prairie-Red	Point Bar
	16SL11	Teche-Mississippi*	Backswamp
	16SL15	Teche-Mississippi*	Point Bar
	16SL20 (USL)	Boeuf-Red	Backswamp
	16SL21	Petite Prairie-Red	Abandoned course
	16SL23	Petite Prairie-Red	Abandoned course
	16SL25	Teche-Mississippi	Abandoned course
	16SL28	Teche-Mississippi	Abandoned course
	16SL77	Boeuf-Red	Point Bar
	16SL81	Teche-Mississippi*	Abandoned course
	16SL87	Teche-Mississippi*	Point Bar
	16SL94	Teche-Mississippi	Backswamp
Mississippi	16SL2	Petite Prairie-Red	Backswamp
	16SL10	Petite Prairie-Red	Backswamp
	16SL22	Petite Prairie-Red	Abandoned course
	16SL41	Teche-Mississippi	Backswamp
	16SL77	Boeuf-Red	Point Bar
	16SL81	Teche-Mississippi*	Abandoned course
	16SL87	Teche-Mississippi*	Point Bar

*May be associated with Boeuf-Red episode.

Table 27. Association of Components with Active or Relict Drainages.

Period/Phase	Active Drainage	Relict Drainage	Prairie Terrace	Total
Paleo-Indian	0	0	2	2
Archaic	5	0	1	6
Poverty Point	0	0	0	0
Tchula/Tchefuncte	0	1	0	1
Marksville	1	4	0	5
Troyville	1	4	0	5
Coles Creek	2	11	0	13
Mississippi	1	6	0	7
Total	10	25	4	39

parent stream. From the perspective of the present study, this association is assumed to represent the selection of these features due to the presence of attributes which may or may not be related to the active phase of deposition. Given the reoccupation of most abandoned courses in the project area by smaller streams (e.g., the modern bayous), these areas could be expected to contain active channels of significantly smaller magnitude than the rivers responsible for their initial formation. This may reflect an orientation towards smaller active streams or the selection of both abandoned and active channels as suggested above. This emphasis on smaller streams or relict drainages would permit access to most of the resources available during active periods without the erosional, depositional, and flooding activities associated with larger fluvial episodes.

Another aspect of this correlation with relict drainages is the possibility of site loss during the active depositional periods. That is, sites may have existed along the active meander belts but were destroyed by the reworking of these deposits by the parent stream. Those sites which were located on relict drainages would become more common than those on active drainages. The presence of older sites on active drainages and at least one or two sites representing the Woodland and Mississippi periods on active drainages, however, suggests that the meandering of the parent streams has not resulted in the loss of all sites in the active meander belt.

This implies that the association of Middle Woodland, Late Woodland, and Mississippian sites with features of contemporary fluvial episodes will be difficult due to a number of reasons (e.g., conscious selection, site destruction, site burial, etc.). Sites associated with the older phases or periods (i.e., Paleo-Indian, Archaic, or Early Woodland) will provide a better correlation than those associated with the later prehistoric phases. This does not detract from efforts to employ these periods to aid in the determination of the age of archeological sites. Rather, these results provide a better definition of the relationship between the past fluvial episodes and contemporary archeological periods and phases.

An Evaluation of the Sampling Strategy and Land Use Model

The preceding discussions presented site densities for the reaches and the geomorphological features employed to stratify the Bayou Cocodrie and Tributaries Project area. In addition, a number of comparisons between these data and additional sets of data have been presented to assess the adequacy of the sample and the validity of any interpretations drawn from it. Several factors have been discussed which may have affected the results of the sample survey. These factors can be considered in three groups: weaknesses in the model of land use, weaknesses in the sampling strategy, and weaknesses in the sampling methodology.

The model of prehistoric land use developed in Chapter III employed the stratification of the project area into four geomorphological features. These features represent a macro level of definition for strata. While other features were present which could have been employed to create strata within the project area, these features were the most obvious and easiest to distinguish from map data alone. Buried features, such as relict channels of the Red River, are present within the project area. As discussed below, these smaller features may have had a strong influence on the location of sites by prehistoric peoples. Field reconnaissance prior to the design of the sampling strategy would have been necessary to determine whether these features could be identified on the ground or whether they were indeed buried below deposits derived from the macro features employed in the stratification.

The ability of the model to reflect prehistoric land use accurately can be assessed also through considerations of these smaller features. It has been noted that observed archeological resources associated with abandoned channels within the region do not conform with the expectations for such resources within the model. In fact, the one site which represents a prehistoric maintenance locale, 16SL94, may be associated with a buried channel of the Red River within the backswamp stratum of Reach M. The silty soils found at this site are more likely to have resulted from deposits near this channel rather than during overbank flood episodes within a backswamp. Figure 17 displays a portion of the USACE (1982) Opelousas 15 minute quadrangle with the location of 16SL94 indicated with respect to the geomorphic features present within the immediate area of the site.

The association of a maintenance locale with an abandoned channel may indicate that other factors were influencing the location of human activities within the alluvial floodplain than those defined through the model. While resource extraction sites are expected to occur along the peripheries of abandoned channels, the presence of a maintenance locale at such a location is not expected. Some of the factors that may have contributed to such an occurrence include the selection of the channel as a site location during its active period. The natural levees associated with this watercourse would provide all of the resources expected to exist within the abandoned course stratum. In fact, an abandoned channel would be identical to an abandoned course while the parent stream actually occupied the channel. Therefore, the model does not reflect accurately all possible uses of the geomorphic features upon which it is defined.

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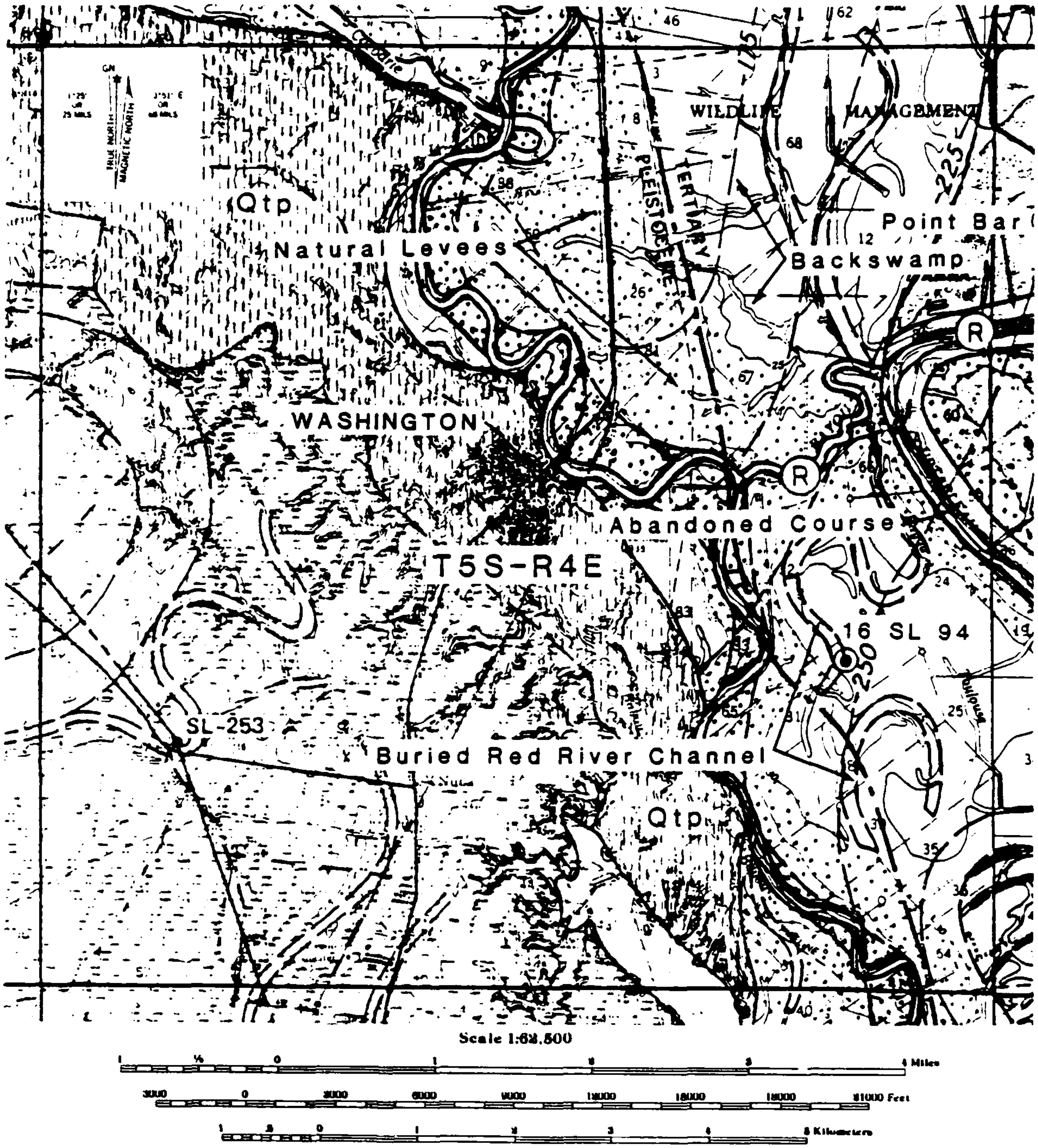

Figure 17. T5S, R4E from the USACE (1982) Opelousas 15 minute quadrangle showing the location of 16SL94 with respect to the major geomorphic features and a buried Red River channel.

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Efforts to overcome this problem could include the redefinition of the abandoned channel stratum to include the natural levees associated with the watercourse during its active period. This would increase the area of the stratum within a region and include the sites along the edge of the channel proper. The identification and association of natural levees with particular drainages is difficult. Such delineations could lead to greater confusion than exists within the model at present. Another approach would be to combine the abandoned channel and abandoned course strata into a single feature. This would increase the area of two of the strata in the region and combine all locations of similar resources into a single unit. Such a procedure would remove the obfuscation created by having to delineate or define the natural levees associated with a particular watercourse. A third possibility is the inclusion of the small buried channels as a separate stratum. While the inclusion of an additional small stratum would serve to characterize the alluvial floodplain better, and thereby provide a better sampling "environment", the increased complexity of the model would require additional efforts to accomodate the small areas of many of the strata. Such an increase in complexity, while creating a better approximation of the real setting, would also increase all logistical considerations concerning the actual examination of a sample unit (Lightfoot 1986; Plog 1976). These increases in time and cost may not be acceptable to many researchers or sponsoring agencies. Further studies employing either or all of these alternatives, or another possibility not described herein, would be necessary to establish which option provides the best results.

If the association of 16SL94 with an abandoned channel is accepted, the site densities by geomorphic stratum would be affected. The density of sites within the abandoned channel stratum would be very high (0.1 sites/ha or 0.04 sites/acre). This exceeds the density observed for the point bar stratum within the project area. The new relative densities of sites among the geomorphic strata (i.e., abandoned course, abandoned channel, point bar, and backswamp in descending order) would reflect those generated from the regional data discussed above. This suggests that the model could be improved by the inclusion of these smaller features in the abandoned channel stratum or a larger abandoned channel/course stratum.

With regard to the nature of the sites located, the association of the Milburn site (16SL94) with the abandoned channel stratum does not fit the model described in Chapter III. The abandoned channel stratum would contain a maintenance site. The presence of this kind of site within the abandoned channel stratum is not expected due to the predilection for these areas to contain lakes or swamps. The presence of a maintenance site can be explained if the site was established during the active period of the channel as described above. While the inclusion of 16SL94 in the abandoned channel stratum presents a better approximation to observed conditions after the survey, it cannot be included in this stratum except as an exercise without seriously compromising the objectivity of the survey. Therefore, the location of the Milburn site (16SL94) and its two components will be considered as backswamp.

Additional efforts to improve the model would include detailed reviews of ethnographic and historical literature to derive more specific information concerning prehistoric land use in the region or in similar environmental settings. These reviews would strengthen the model by defining activities as well as resources which could be expected to occur within the strata. These sources may also provide corroborative information concerning the definition of geomorphological strata within the alluvial floodplain.

With regard to weakness in the sampling strategy, small sampling fractions may have contributed to the low numbers of discovered sites within Reaches K and L and some of the geomorphic strata. Smaller sampling fractions create lower probabilities for the discovery of subsurface materials during shovel testing programs (Stone 1981). Larger sampling fractions, by definition, have a greater potential to reflect accurately the population being sampled. Therefore, the low sample fractions displayed by Reach K (2.7 per cent) may be inadequate to represent the actual population of archeological resources within the project area. The poor representation for Reach L (i.e., the discovery of no sites within the sampled area but their location outside the sampled area) may indicate that sample fractions greater than ten per cent per reach may be necessary to acquire a representative sample.

Within the geomorphic strata, sampling fractions are more difficult to assess. Sampling fractions within the backswamp stratum may be too low (3.6 per cent). As discussed above, however, the abandoned channel stratum may not be represented properly. If this is the result of a low sampling fraction rather than a problem with definition, as described above, then fractions greater than sixteen per cent would be necessary to obtain a representative sample from the geomorphic strata. Efforts to overcome these problems would necessitate the redistribution of sample units within the strata or reaches or an increase in the overall sample size (i.e., greater than five per cent).

Weaknesses in the methodologies include the spacing of shovel tests and the location of sample units. Assessments of shovel test intervals have been presented above. A shorter interval (ca. 50 meters) between shovel tests along a transect may have resulted in the recovery of more archeological sites. Additional surveys would be necessary to determine whether this revision would increase the number of sites discovered. The location of sample units within a stratum could be altered to insure that sample units are positioned to intersect certain aspects of each stratum (e.g., perpendicular to small ridges or water courses, along the periphery of abandoned channels, etc.) as suggested by Nance (1979:175-176). While this would detract from the random aspects of the sample, it could increase the probability for discovering sites. Additional survey efforts employing similar techniques within the region should consider this purposive aspect of transect orientations.

In summary, weaknesses within the model, the sampling strategy, and its implementation may have affected the results of the survey. The major effect may have reduced the ability of the sample to reflect accurately the population of archeological sites within the project area. Efforts to overcome some of these problems have been presented and discussed above. Other directions for preventing or alleviating these problems have been discussed but require new surveys or examinations of data beyond the scope of this project. The sample information derived from this survey shall be accepted as valid, however, despite these caveats. Future efforts to examine the region or similar efforts should consider these weaknesses in the design and implementation of probabilistic surveys.

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CHAPTER VIII

ASSESSMENT OF THE EFFECTS OF PRESENT AND PROJECTED LAND USE ON THE ARCHEOLOGICAL RESOURCE BASE

The primary focus of this chapter is to attempt to predict the probability and extent of possible impact to the archeological resource base within the wooded portions of the Bayou Cocodrie and Tributaries Project area. Portions of these areas are expected to be cleared as a result of reduced flooding and improved drainage which will result from the completion of the project. Most of these cleared areas are expected to be converted to agricultural land.

The data generated during the probabilistic survey of the wooded area within the three-year flowline and previously recorded sites within the project area will be employed to characterize the archeological resource base. The possible impacts to these resources will be discussed in terms of the effects related to total site frequencies, frequencies by temporal periods or phases, and site types.

The data related to present land use have been drawn from Gulf South Research Development Corporation (1984) and plottings of cleared areas extracted from photo-imagery provided by the New Orleans District, U.S. Army, Corps of Engineers. These sources provide area estimates of land clearance over the past decade and estimates of areas expected to be cleared as a result of the completion of the project. These data provide a guide to expected changes in present land use which may impact the archeological resource base.

A Description of Projected Land Use Changes

Percentages of the wooded and cleared portions of the three reaches are displayed in Table 1 above. These percentages are based on data gathered by Gulf South Research Development Corporation during 1984. These data can be modified to estimate the percentages of cleared and wooded area as of 1979 and 1983 by adding the data extracted from aerial photo-imagery provided by the New Orleans District, U.S. Army Corps of Engineers. These percentages are displayed in Table 28.

From these data, rates of change in land use can be estimated. These rates are displayed in Table 28. If combined with the expectations of the New Orleans District, U. S. Army Corps of Engineers, for clearance induced by the completion of the Bayou Cocodrie and Tributaries Project, rates of this induced clearance

Table 28. Wooded Areas and Estimated Rates of Clearance for Reaches K, L, and M.

Area (Hectares)

Reach	Total Area Acres	Total Area Ha	1979 Cleared	1979 Wooded	1981 Cleared	1981 Wooded	1984 Cleared	1984 Wooded	After Project Completed Cleared	After Project Completed Wooded
K	17,400	7042	863	5997	2551	4309	3098	3764	3284	3576
L	5,700	2307	1534	571	1862	243	1491	614	1560	546
M	3,700	1497	402	974	769	607	769	607	799	577

Area (Per Cent)

Reach	1979 Cleared	1979 Wooded	1981 Cleared	1981 Wooded	1984 Cleared	1984 Wooded	After Project Completed Cleared	After Project Completed Wooded
K	12	85	36	61	44	53	47	50
L	66.5	25	81	10.5	65	26.5	67.5	23.5
M	27	65	51	41	51.5	40.5	53	39

Per Cent Change

Reach	1980	1981-1984	Project Induced
K	28	13	5
L	57	0	11
M	38	0	5

can be estimated. The areas expected to be cleared as a result of the completion of the project are: 188 hectares (465 acres) in Reach K, 68 hectares (165 acres) in Reach L, and 30 hectares (75 acres) in Reach M. These rates are displayed in Table 28 also.

It should be noted that these observed losses in woodland (i.e., clearance prior to 1984) are less than estimates projected for Louisiana by MacDonald et al. (1979). During their study of the loss of bottomland hardwood areas in the lower Mississippi Valley, Louisiana displayed the only continued rising trend in loss over the last fifty years. The rate of loss is expected to rise through 1995 to approximately nine per cent (MacDonald et al. 1979:99). While this rate applies to the state as a whole, the Atchafalaya Basin is expected to experience a 9.5 per cent decrease in bottomland hardwood forest every five years from 1980 to 1995 (MacDonald et al. 1979:111-115). It should be noted, however, that all other states in the study area except Louisiana, displayed a peak rate of loss in the period ending in 1967 and a subsequent drop in the percentage loss of bottomland hardwood forest during the ensuing decade (MacDonald et al. 1979:30-31). Louisiana displayed a peak rate of loss during the last decade in the study. This trend was assumed to continue through the future periods presented by MacDonald et al. (1979) for projected rates of loss.

A number of factors contribute and control the rate of clearance within the bottomland hardwood forest. Prolonged drought (over ten year periods) is the only natural activity which increases rates of clearance in the lower MIssissippi Valley (MacDonald et al. 1979:88-89). Human activities which influence rates of clearance include U.S. Army Corps of Engineers projects and Soil Conservation Service projects which improve drainage within the bottomland areas. MacDonald et al. (1979:85) identified a direct relationship between the increasing number of these projects and a rising rate loss of bottomland hardwood forest throughout their study area. They note, however, that the rates of clearance are linked closely with economic conditions (e.g., crop prices and timber prices). The amount of influence possessed by these variables for controlling rates of clearance is not known. These economic factors and the absence of completed drainage improvement projects undoubtedly contribute to the lower rate of clearance observed in the Bayou Cocodrie and Tributaries Project area during the present study.

Table 28 displays the projected percentage of loss given the completion of the Bayou Cocodrie and Tributaries Project. These areas represent percentage losses of five, eleven, and five per cent in Reaches K, L, and M, respectively. This suggests that completion of the project will not increase the rate of clearance in Reach K, but will dramatically increase the rate of clearance in Reaches L and M.

Reach L is considered to display the highest overall potential for land clearance. This reach displays the highest rate of loss as a result of project induced land clearance. These losses will represent 58 hectares (165 acres) of woodland within the three-year flowline. Woodlots in this reach are very dispersed and small. They constitute only twenty-four per cent of the total reach and 26.5 per cent of the area within the three-year flowline. With the exception of an extensive swamp in the southeast corner of the reach, these wooded areas primarily parallel the drainages within the reach. The lower area in the southeast portion of the reach may be expected to receive the most benefit from reduced flooding and improved drainage. Therefore, the majority of land clearance may be anticipated in this part of the reach. This area lies within the backswamp stratum defined in preceding chapters. The narrow strips paralleling streams, representing abandoned course or point bar deposits, are not likely to be cleared since the resultant increase in tillable land would be minimal. Interestingly, this reach displays the largest average farm size (mean size= 1700 acres, GSRDC 1984:21). Whether this reflects the extensive amount of clearing that occurred in Reach L prior to 1979 or an overall trend is unknown.

The reach with the next highest overall potential for the conversion of wooded land to cleared land is Reach K. It displays the next highest predicted rate of loss with the completion of the Bayou Cocodrie and Tributaries Project. The percentage loss represents 188 hectares (465 acres) of woodland. Most of this clearance could be expected within backswamp deposits given the extensive distribution of this stratum through the reach. The potential for clearance is a reflection of the concentration of wooded areas and the high percentage of wooded area within this reach. That is, Reach K contains the highest percentage of wooded area among the three reaches plus the largest total area in woodland. In addition, these woodlands occur in large parcels within the reach as opposed to the scattered woodlots observed in Reaches L and M. No associations of these woodlots with drainages are apparent in Reach K, as is the case in the Reach L. These factors contribute to the higher potential for the clearance of wooded areas within Reach K than Reach M despite the similar rates of clearance (i.e., 5 per cent) expected within both reaches. The larger size of farms in Reach K (mean size= 1365 acres, GSRDC 1984:14) may be another factor which contributes to this higher potential. Larger acreages per farm are assumed to reflect relative wealth among farms. Under stable economic conditions, wealthier farmers could be expected to be able to invest time and effort to expand their productive areas, whereas less wealthy farmers may not be able to afford this investment.

The reach with the lowest overall potential for clearance is

Reach M. The percentage loss of woodland will represent thirty hectares (75 acres) within the three-year flowline. This reach contains the second largest percentage of wooded area and larger individual woodlots than Reach L. The more dispersed distribution of woodlots than in Reach K and smaller farm sizes (mean size= 372 acres, GSRDC 1984:26) prevent this reach from having a greater potential for clearance. Woodlots within the reach lie towards the center of the reach along Bayou Toulouse. These wooded areas represent large parcels of land rather than narrow strips along the drainage as observed in Reach L. These woodlots cover abandoned course, point bar and backswamp deposits within Reach M.

Impacts on the Resource Base

From the above discussions, Reach L is predicted to have the greatest potential overall for land clearance, Reach K is expected to have the next highest overall potential, and Reach M the least potential overall. When coupled with the estimated site densities within the reaches calculated in Chapter VII, these rankings will provide an idea of the scope of potential project induced impacts within each reach. In addition to these possible induced impacts, if drainage improvements, designed and implemented by the Soil Conservation Service, occur, additional impacts to the resource base may result. The extent of these impacts will be estimated employing the site densities developed above. This will permit statements concerning the possible impacts to the archeological resource base of the Bayou Cocodrie and Tributaries Project area.

Impacts as a Result of Land Clearance

Reach L displays the highest estimated site density and the greatest potential for clearance with the completion of the Bayou Cocodrie and Tributaries Project. Therefore, Reach L is expected to contain the greatest potential for impacts to archeological sites. Reach M displays an equally high expected density of sites. Given its minimal potential for land clearance, Reach M is expected to possess the next highest potential for possible impacts. Reach K displays the lowest expected density of archeological sites. With its moderate potential for land clearance, this reach possesses a lower potential for impacts upon archeological sites than Reach L. Its potential for impacts is similar to that expected for Reach M, however, given the greater amount of actual area expected to be affected by land clearance in this reach.

The intensity of these possible impacts can be expressed by estimating the number of sites that will be affected by the predicted amount of land clearing within the project area. The clearance of 188 hectares (465 acres) in Reach K will result in impacts to three archeological sites. The clearance of 68 hectares (165 acres) of woodland in Reach L will result in impacts to two archeological sites. The clearance of 30 hectares (75 acres) of woodland in Reach M will result in impacts to one archeological site. These figures are displayed in Table 29.

In total, six sites are expected to be impacted by project-induced land clearance. These sites represent 6.7 per cent of all archeological resources within the wooded portions of the three-year flowline. All of these sites are expected to contain historic components. All sites in Reach K would be expected to represent historic occupations. Based upon the only site observed within Reach L during the survey, the two sites could be expected to contain both historic and prehistoric materials. There is a probability of 0.6 that any site in Reach M will contain a prehistoric component.

The nature of the sites to be impacted by this clearance will be discussed with respect to site type and temporal association. This will permit statements concerning the nature of the effects of the predicted impacts upon the archeological resource base of the project area. All historic components are expected to represent late nineteenth to early twentieth century occupations. There is a probability of 0.83 for any of the historic components to represent late nineteenth to early twentieth century secondary refuse disposal sites. Prehistoric sites can be defined as to resource extraction or maintenance loci and assigned to temporal periods.

Any historic site discovered in Reach K is expected to represent a late nineteenth to early twentieth century secondary refuse disposal locale. Any historic sites discovered in Reach L are expected to represent late nineteenth to early twentieth century refuse disposal sites. Any historic site discovered in Reach M has a probability of 0.8 of representing a secondary refuse disposal locale of this period. There is also a probability of 0.2 that any site in Reach M would represent a habitation site of the same period.

No prehistoric sites are expected to exist within Reach K. Any prehistoric sites discovered within Reach L are expected to represent resource extraction sites, given the nature of the only site observed within the reach during the survey. Any prehistoric site discovered in Reach M has a probability of 0.66 of representing a resource extraction site. The probability of a site representing a maintenance locus is 0.33. There is a probability of 0.33 for any site to contain multiple components.

Table 29. The Predicted Number of Sites to be Impacted by Land Clearance within the Three-year Flowlines in Reaches K, L, and M.

Reach	Density (/ha)	Wooded Area Ha	Wooded Area Acres	Area Cleared Ha	Area Cleared Acres	Sites Impacted
K	0.014	3764	9300	188	465	3
L	0.03	614	1517	68	165	2
M	0.03	607	1500	30	75	1
Total						6

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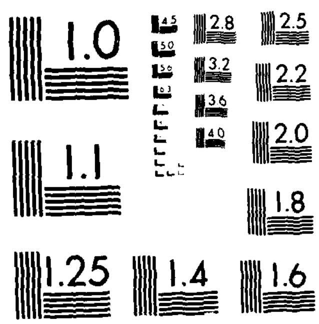

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The only maintenance locus observed in Reach M is multicomponent. All resource extraction sites observed within the reach are single component sites.

Any prehistoric site discovered within Reach L is expected to contain a Middle to Late Woodland component, based on the only site observed within the reach during the survey. Any site discovered in Reach M has a probability of 0.66 for containing a Marksville component. There is a probability of 0.5 that any Marksville site will represent a resource extraction or a maintenance locale. There is a probability of 0.33 that any prehistoric site will contain a Coles Creek component. Such a site would be expected to represent a maintenance locale. There is a probability of 0.33 that any site discovered in Reach M will contain non-diagnostic cultural materials. Such a site would be expected to represent a resource extraction locus.

In summary, six sites in total are expected to suffer impacts as a result of project-induced land clearing within the three-year flowline of the Bayou Cocodrie and Tributaries Project area. Three of these sites will lie in Reach K; two will be located in Reach L; and, one will be located in Reach M. All of these sites are expected to contain late nineteenth to early twentieth century historic components. Most will represent secondary refuse disposal areas. There is a probability of 0.2, however, that the historic site expected to suffer impact within Reach M will represent a habitation site.

Both of the sites in Reach L are expected to contain prehistoric components. There is a probability of 0.6 that the site in Reach M will contain a prehistoric component as well. All of these prehistoric sites are expected to represent resource extraction sites. However, there is a probability of 0.33 that the site in Reach M will represent a maintenance site. If so, it is expected to contain two components. In general, most prehistoric sites impacted within the three-year flowlines are expected to contain Middle to Late Woodland components. More specifically, there is a probability of 0.5 that these sites will contain a Marksville component. There is a probability of 0.25 that any site would contain a Coles Creek component.

Impacts as a Result of SCS Drainage Improvements

After the completion of Bayou Cocodrie and Tributaries Project, drainage within the region may be improved further by excavation of drainage laterals and the channelization of existing watercourses through programs similar to those conducted by the Soil Conservation Service. While such plans do not exist for the project area at present, the maximum intensification of agricultural endeavors could be realized through these construction activities. Any impacts which would result to the archeological resource base of the project area from these SCS-type drainage improvements would represent indirect impacts as a result of the completion of the Bayou Cocodrie and Tributaries Project. They become a possibility if the project is completed. Therefore, these possible impacts are defined as project-related rather than project- induced.

Data for the scope of these activities within the Bayou Cocodrie and Tributaries Project area have been estimated from the results of a similar SCS-type project in Eastern Rapides and South Central Avoyelles Parishes, adjacent to the present project area. These projections, as developed by the New Orleans District, U. S. Army Corps of Engineers, suggest that 360 acres (146 hectares) of wooded land and 377 acres (152 hectares) of open land will be affected by any construction activities. These activities will result in the creation of 82 acres (33 hectares) of new channels, 121 acres (49 hectares) covered by berms or dredged material, and 534 acres (216 hectares) of new open land improved by the spreading of dredged materials and through agricultural development. All of these data are presented in Table 30.

Since these activities would occur within the 100-year flowlines of the project area, the estimated site densities for each reach within the three-year flowline will be applied to the areas for the the larger floodpool. Both cleared and wooded areas will be included, rather than just the wooded areas as in the above discussions, since both cleared and wooded areas would be affected by any SCS-type drainage improvements. The site densities estimated from the five per cent sample survey of the wooded portions of the three-year flowlines are assumed to represent site densities throughout the project area. The location of the construction activities with respect to the reaches is unknown. Therefore, the projected areas to be affected will be distributed between the reaches in proportion to their their composition of the total project area. That is, since Reach K contains 60 per cent of the total project area within the 100-year flowlines, 60 per cent of all areas affected by SCS-type drainage improvement activities would occur within this reach. Summaries of the distribution of the projected areas among the reaches are displayed in Table 31.

Given the estimated site densities developed above for each reach, the number of sites expected to be impacted by SCS-type drainage improvements could be calculated. Approximately three sites are expected to experience impacts within Reach K. Two sites are expected to experience impacts within Reach L. In Reach M, approximately two sites are expected to experience impacts as a result of SCS-type drainage improvements. This would represent impacts to 2.0 per cent (7 of 352) of all archeological resources

Table 30. Projected Areas to be Impacted by SCS-type Drainage Improvements within the Bayou Cocodrie and Tributaries Project Area.

Losses from Existing Areas	Acres	Ha	Gains to Existing Areas	Acres	Ha
Wooded	360	146	New Channels	82	33
Cleared	377	152	Disposal Areas & Wooded Berms	121	49
			Open Land	534	216
Total	737	298	Total	737	298

Table 31. The Distribution of Areas to be Impacted by SCS-type Drainage Improvements in Reaches K, L, and M.

Reach	Total Area 100-year flowline Acres	Total Area 100-year flowline Ha	% Total	New Channels Acres	New Channels Ha	Berms, Disposal Areas Acres	Berms, Disposal Areas Ha	Open Land Acres	Open Land Ha	Total Area Impacted Acres	Total Area Impacted Ha
K	25,300	10,239	60	49	20	73	30	320	129	442	179
L	9,900	4,007	23	19	7.5	28	11	123	50	170	68.5
M	7,300	2,954	17	14	5.5	20	8	91	37	125	50.5
Total	**42,500**	**17,200**		**82**	**33**	**121**	**49**	**534**	**216**	**737**	**298**

expected to exist within the 100-year flowlines of the Bayou Cocodrie and Tributaries Project area. These totals are summarized in Table 32.

The nature of these sites can be predicted as above. All sites would be expected to contain late nineteenth or early twentieth century historic materials. All of the probabilities described above for sites within the reaches would be applicable to the seven sites expected to experience impacts as a result of SCS-type drainage improvements. If these probabilities are accepted, a total of seven historic occupations and four prehistoric ones would be represented at seven locales within the project area. Prehistoric occupations would be expected in Reaches L and M.

While all three of the kinds of activities associated with SCS-type drainage improvements (i.e., the improvement or excavation of channels, the construction of berms and disposal of dredged materials, and the spreading of dredged materials and agricultural development in cleared areas), are expected to impact archeological resources, the severity of these impacts as a result of each activity is different. The actual excavation or improvement of watercourses would represent the most severe kinds of impacts. The spreading of dredged materials and subsequent agricultural exploitation of cleared areas would represent the next most severe kinds of impacts. The construction of berms and the disposal of dredged materials, most of which would be reforested, would present the least severe impacts to archeological resources. The numbers of sites expected to affected by each of these activities could be predicted. Table 33 displays a summary of the predicted numbers of sites to be impacted and their associated severities of impacts.

The excavation of channels would be expected to impact one archeological site. The spreading of dredged materials and the agricultural development of open lands would be expected to impact five archeological sites. The construction of berms and the disposal of dredged materials would be expected to impact one site. This suggests that most of the impacts to archeological resources expected as a result of SCS-type drainage improvements would be below the maximum level of severity (i.e., resulting from the excavation of new channels) anticipated for these impacts.

Site-Specific Impacts

The nature and scope of the impacts expected to affect the percentages of the archeological resource base of the Bayou Cocodrie and Tributaries Project area will be discussed with respect to site-specific effects. The bases for these discussions are drawn from observations made at the sites

Table 32. The Numbers of Sites Expected to be Impacted by SCS-type Drainage Improvements in Reaches K, L, and M.

Reach	Total Area 100-year flowline Acres	Total Area 100-year flowline Ha	Areas Impacted Acres	Areas Impacted Ha	Site Density (/ha)	Sites Impacted	Total Sites
K	25,300	10,239	442	179	0.014	3	143
L	9,900	4,007	170	68.5	0.03	2	120
M	7,300	2,954	125	50.5	0.03	2	89
Total	**42,500**	**17,200**	**737**	**298**		**7**	**352**

Table 33. The Numbers of Sites Expected to Be Impacted by each of the Activities Associated with SCS-type Drainage Improvements.

		AREA IMPACTED						SITES IMPACTED			
		New Channels		Berms, Disposal Areas		Open Land					
Reach	Site Density	Acres	Ha	Acres	Ha	Acres	Ha	New Channels	Berms, Disposal Areas	Open Land	Total
K	0.014	49	20	73	30	320	129	0.3	0.4	1.8	2.5 (3)
L	0.03	19	7.5	28	11	123	50	0.2	0.3	1.5	2
M	0.03	14	5.5	20	8	91	37	0.2	0.2	1.1	1.5 (2)
Total		82	33	121	49	534	216	0.7 (1)	0.9 (1)	4.4 (5)	7

discovered during the survey. Some aspects of these impacts have been alluded to above.

Specific types of impacts will be threefold. Initially, project-induced land clearance will occur. This will include the removal of existing bottomland hardwood forests by any number of techniques. Once cleared, this land will most likely come under cultivation (MacDonald et al. 1979:35-36). Agricultural activities represent the second source of possible impact. The third type of possible impacts will result from activities related to the implementation of SCS-type drainage improvements. These activities will include the construction and improvement of ditches or watercourses to improve drainage within specific parcels of land. These construction activities will permit additional clearing and subsequent agricultural activities. No such improvements are scheduled within the project area at present.

The possibility of adverse impacts to historic sites resulting from activities related to land clearance and cultivation is higher than to prehistoric ones. Given their more recent ages of deposition, these sites can be expected to display better spatial and/or contextual associations between their internal components (i.e., artifacts, features, etc.). With respect to secondary refuse disposal sites which constitute the majority of the predicted resource base within the project area, these kind of associations (i.e., spatial/contextual) may be minimal. Much like prehistoric resource extraction sites, it is the location of these refuse disposal sites with respect to other types of contemporary sites which is important. Given the small amount of dispersal associated with most agricultural activities (Roper 1976), the locations of refuse disposals should not be disturbed severely by land clearance or cultivation. The possibility of damage to the diagnostic artifacts within these sites, however, is quite high. The loss of time-sensitive materials would prevent the association of a refuse disposal site to a tightly delimited temporal span. Long-term exposure to agricultural activities may increase the probability for this kind of adverse impact. The construction of drainage ditches or channels through secondary refuse disposal sites can be expected to produce the most adverse effects of the project-induced sources defined above. These activities could be expected to destroy any contextual information and many of the artifacts present in these sites. While the construction of berms or the disposal of dredged materials or ditch fill is not expected to destroy archeological resources, these activities may result in their removal from the archeological record by covering the sites with sufficient overburden to prevent their discovery. Since the location of these sites with respect to other sites constitutes the major information content of the site, such an occurrence would be as adverse as the actual destruction of the site.

With respect to historic habitation sites, all activities related to the three sources of impact will result in adverse effects upon the archeological resource base. Land clearance and agricultural activities can be expected to damage or destroy most of the extant architectural features present in these sites. Many of the contextual relationships between artifacts and features will be lost as well. The construction of ditches or channels through these sites would represent the most dramatic impact. Given the generally greater area of such sites, the deposition of overburden may not affect such sites to the same extent as secondary refuse disposal sites. The adverse effect will be no less severe than that expected for initial clearing or cultivation; however, these activities may be more "localized", affecting a narrow portion of the site rather than its entire surface.

Field observations lend support to these expectations. All of the refuse disposal sites discovered in agricultural fields displayed a dispersal and diminution of their artifactual materials. Diagnostic artifacts are recoverable from these sites at present. Long-term monitoring of these sites, or similar ones, would be necessary to determine the extent of possible damage to these sites created by continued exposure to cultivation. The only possible habitation site (16SL93, the LeBlanc #2 site) encountered during the survey contained no extant architectural features. Some brick fragments and window glass (absent from associated assemblages in nearby sites, 16SL91 and 16SL93) were present. These kinds of artifacts, plus the presence of extensive faunal remains, permitted the designation of the LeBlanc #2 site (16SL93) as a possible habitation. The extent of damage to this site which resulted from the clearance of the field containing it is unknown at present. Interviews with the landowner or neighboring residents would be necessary to determine whether any intact structural remains existed at the site prior to the clearing and cultivation of the area. The inability of the survey crew to determine positively the function of the site lends credence to the predicted extent of adverse effects postulated for historic habitation sites.

As stated above, the majority of the prehistoric sites expected to occur within the three-year flowline of the Bayou Cocodrie and Tributaries Project area represent resource extraction sites. These sites are expected to provide little information beyond locational data. The effect of actual land clearance on these sites is expected to be minimal. The deposits which contain cultural debris are expected to contain little contextual integrity. Therefore, disturbances to these deposits will not destroy the primary kinds of information recoverable from these sites. Subsequent agricultural activities will do little to disturb further or destroy the information contained in these sites. These activities cannot be expected to move the materials present at the site beyond their general ecological or geomorphological setting (Roper 1976). The construction of facilities through SCS-type drainage projects could place these materials into secondary deposits (e.g., spoil banks). As with the first two sources of impacts, these displacements are not likely to alter drastically the information content of resource extraction sites. They may affect the probability of discovering the sites if large areas are covered with overburden.

Field observations made during the survey support this assumed lack of adverse impacts to resource extraction sites. All of the resource extraction sites discovered during the survey lie in areas presently under cultivation. All were cleared in the last ten years. No subsurface deposits were discovered at any of the sites. In addition, no disturbances related to either forest clearance or agricultural activities were discovered at depths greater than twenty centimeters below ground surface. Plowzones ranged from seven to seventeen centimeters below ground surface in all portions of the project area which were inspected. Therefore, if subsurface deposits do exist on resource extraction sites, forest removal and agricultural activities are not likely to impact these kinds of materials adversely. The effects of drainage construction activities could produce adverse impacts for intact buried deposits. If the construction activities are localized, however, these impacts should be minimal.

With regard to maintenance sites, similar assumptions concerning the nature and extent of possible impacts can be made. These types of sites will present greater opportunities for adverse impacts due to the increased contextual integrity anticipated for such locales. Specific effects of forest clearance could be predicted only if the specific techniques employed were known. The potential for adverse impacts resulting from the the removal of tree stumps by tractors or burning is high. These activities could disturb many of the spatial relationships between the cultural materials present at maintenance sites or reduce the pristine nature of features or materials. Agricultural activities can be expected to create minor disturbances to the general location or distribution of materials. Deep perturbations of the soils at a site may cause damage similar to that noted above for forest clearing. The additional effects of chemicals employed to enhance crop yields on archeological materials is unknown at present. Agricultural disturbances, however, should be less than those caused by land clearing. Drainage construction could result in extensive damage to maintenance sites. As with forest clearance or deep plowing, much of the contextual information of materials or deposits within these sites could be disturbed.

Despite the high potential for adverse impacts, field observations suggest that forest clearing and present agricultural activities within the project area have not damaged extensively the maintenance site discovered during the survey. The site identified as a maintenance locus is in an agricultural field which was cleared within the last year. Subsurface cultural deposits existed at this site at depths ranging from fifteen to forty-five centimeters below ground surface. The plowzone at the site ranged from seven to fifteen centimeters below the ground surface. The present activities appear to have little potential for causing extensive damage to the subsurface deposits. This statement must be qualified, however, since portions of the site occupy a small mound which has undoubtedly been enhanced by human occupation. Increased erosion off this feature following land clearance and efforts to reduce relief over the field to improve mechanical cultivation will result in higher potential damage to the subsurface deposits at this site than would be the case if the site were not associated with a small mound. These activities, while creating adverse impacts at particular sites, are not expected to be operable in most portions of the project area. As stated above, the construction of drainage ditches through the observed maintenance site would disturb the extant subsurface deposits to a high degree. Such disturbances would represent the most adverse impacts predictable for these kinds of sites. As with historic habitation sites, the construction of berms and/or the deposit of dredged or excavated materials would have less effect given the greater area expected for such sites.

Regional Impacts

The effect of any adverse impacts on the regional archeological resource base can be discussed with respect to historic sites and prehistoric sites. In addition, site types within this general temporal dichotomy will be employed to delimit the regional effects of possible adverse impacts.

Historic sites within the Bayou Cocodrie and Tributaries Project area are expected to represent primarily late nineteenth and early twentieth century secondary refuse disposal areas. These locales provide information concerning the dispersion of historic activities over the project area during a period of changing economic, agricultural, and demographic patterns within the region, the state of Louisiana, and the greater southern United States. While these kinds of resources are present in many portions of the Southeast, archeological emphasis is generally directed towards more dramatic manifestations of historic occupations (e.g., large plantation houses, industrial complexes, etc.). The less dramatic activities represented by scatters of secondary refuse do provide the distributional information that is necessary to discuss settlement patterns within the region. While specific impacts to these sites are expected to be minimal, the complete destruction of any site, and its concomitant loss from the archeological resource base, would be regrettable. Such losses are expected to be more likely to result from SCS-type drainage improvements which involve the construction of new channels rather than project-induced land clearance or the other activities expected to occur as part of SCS-type drainage improvements. Site losses are expected to be minimal, however, since only one site (0.3 per cent or 1 of 352) is expected to suffer impact, and possible destruction, as a result of the construction of new channels throughout the 100-year flowline within the entire Bayou Cocodrie and Tributaries Project area. Therefore, impacts to the regional archeological resource base of historic sites as a result of any of the activities discussed above are expected to be minimal.

Impacts to late nineteenth or early twentieth century habitation sites would affect the regional archeological resource base in a similar manner. Adverse impacts are expected to occur from project-induced land clearance and from SCS-type drainage improvements. The latter activities, especially those associated with the construction of new channels, have a greater potential for completely removing these kinds of sites from the archeological resource base of the region. These kinds of sites may be more evident in other sources of information (e.g., historic maps, records, etc.), however, thus reducing some of the impact of their possible loss to the regional resource base. As with secondary refuse disposal sites, only one site is expected to suffer impact, and possible destruction, as a result of the construction of new channels.

Temporal associations for the prehistoric sites observed during the sample survey and expected to experience impact from project-induced land clearance and SCS-type drainage improvements suggest that 50 per cent of all sites within the three-year flowline of the project area will represent Marksville phase occupations. Twenty-five per cent of all sites will contain Coles Creek occupations. At least 25 per cent of all sites are expected to contain non-diagnostic materials as well. This suggests that Middle to Late Woodland cultural manifestations are more common throughout the project area than those of any other temporal period. In particular, Marksville period occupations are expected to be frequent.

If these percentage representations are compared to the inventory of previously recorded sites employed in earlier discussions, similar relationships between the sites of known temporal episodes and unidentified sites are demonstrated. That is, 39 of the 51 sites (77 per cent) extracted from Gagliano et al. (1978), Goodwin et al. (1986), and the present study can be assigned to a known temporal phase or period. The remaining 23 per cent (n= 12) are unidentified. Twenty-three of the 39 identified sites (59 per cent) represent Middle to Late Woodland occupations. Seven sites (18 per cent) represent later (Mississippi) occupations. The remaining nine sites (23 per cent) represent earlier occupations (Early Woodland n= 1, Archaic n= 6, Paleo-Indian n= 2). These percentages suggest that Middle and Late Woodland sites have been discovered most frequently in the region containing the Bayou Cocodrie and Tributaries Project.

Impacts to sites common throughout the region are acceptable. It should be noted, however, that few of the previously discovered sites possess Marksville components. The Bayou Cocodrie and Tributaries Project area is expected to contain primarily sites related to this period. The loss of these sites or information within them could seriously impact the regional archeological resource base. Given that most of these sites are expected to represent resource extraction sites, the effect to the regional archeological resource base may not be as extensive as it would appear. Such loci are expected to contribute locational information. Activities related to project-induced land clearance are not expected to affect adversely the ability of these sites to retain this sort of information. Activities related to SCS-type drainage improvements associated with the construction of new channels possess greater potential for disrupting the information content of these sites given their greater potential for site destruction. As with historic sites, however, only one site is expected to be suffer impact as a result of the construction of new channels during SCS-type drainage improvements. Therefore, impacts to the regional resource base will be minimal.

If any of the sites which suffer adverse impacts represent Marksville period maintenance loci, greater adverse impact to the regional archeological resource base would result. Such sites have great potential to contribute to the better understanding of a significant regional component of the archeological record of Louisiana. As with the other kinds of sites expected to experience impacts, such adverse effects are more probable as a result of SCS-type drainage improvements associated with the construction of new channels than as a result of project-induced land clearance or other SCS-type drainage improvements. The effect of impacts to possible Marksville maintenance sites are not minimized by the probability of only one site suffering adverse impacts. Therefore, impacts to the regional archeological resource base could be high if a Marksville maintenance site is destroyed as a result of the activities associated with the construction of new channels during SCS-type drainage improvements.

Summary

Reach L has been defined as the area displaying the highest potential for land clearance with the completion of Bayou Cocodrie and Tributaries Project. Reach K is expected to display the next highest potential, followed by Reach M with the lowest potential for further clearance. When coupled with the estimated site densities within these reaches, the area with the greatest potential for impacts to the archeological resource base of the project area can be defined. Reach L is expected to display the greatest potential for impacts to archeological sites from project-induced land clearing. Reaches K and M will display similar potentials, lower than that noted for Reach L, for impacts to the archeological resource base.

Within these areas, six sites are expected to be impacted by project-induced land clearing. Three of these sites will be located in Reach K. Two sites located in Reach L are expected to experience impacts. The sixth site will be located in Reach M. The three sites located in Reach K will represent historic occupations. All are expected to represent late nineteenth to early twentieth century secondary refuse disposal sites. Both of the sites in Reach L are expected to represent similar historic occupations. Both sites are expected to contain prehistoric components also. The site expected to experience impact in Reach M has a probability of 0.8 to represent a late nineteenth to early twentieth century secondary refuse disposal site. There is also a probability of 0.2 that this site could represent a habitation site of the same period. There is a probability of 0.6 that the site in Reach M will contain a prehistoric component as well. These six sites represent 6.7 per cent of all archeological resources within the three-year flowline.

The prehistoric components expected to experience impacts as result of project-induced land clearance will represent a Middle to Late Woodland period occupations. There is a probability of 0.5 that any one of these sites will contain a Marksville component, a probability of 0.25 that it will contain a Coles Creek component, and a probability of 0.25 that it will contain non-diagnostic cultural materials. Most likely, this site will represent a resource extraction locus (probability+ 0.75). A probability of 0.25 also exists that the site will represent a maintenance locale.

The nature of the impacts to the information content of prehistoric sites are expected to be minimal. Resource extraction sites (constituting the most probable type of prehistoric site expected to experience impact) provide primarily locational information. This information may not be lost due to the disturbance caused by land clearance and agricultural activities. While land clearance serves to make surface-occurring archeological materials more visible, the dispersal of an already diffuse scatter of material will reduce its archeological visibility. Reduced archeological visibility will lower the probability of recovery for these sites. If one of the prehistoric occupations expected to experience impact represents a maintenance locale, an increased potential for adverse impact as a result of land clearance and agricultural activity exists given the greater information content predicted for such sites. The maintenance site discovered during the survey, however, did not display significant damage as a result of either of these activities. Therefore, current techniques employed within the project area for clearing and cultivating land do not present significant immediate hazards to the prehistoric archeological resources estimated to exist within the project area. In fact, initial clearing of wooded areas enhances the probabilities of discovering archeological sites. Eventually, however, continued disturbances will result in the dispersal of materials from their initial locations of deposition (activity loci or sites), thereby reducing the probability of discovering these resources during future investigations.

With regard to historic sites expected to experience impacts, at least five of the six affected sites will represent secondary refuse disposal locales. These types of sites are not expected to experience significant adverse impacts as a result of current activities employed to clear and cultivate land. If one of the sites represents a habitation site, however, significant adverse impacts to the site can be expected. Therefore, portions of the historic archeological resource base estimated to exist within the three-year flowline of the project area can be expected to suffer adverse impacts as a result of project induced land clearance. These portions will represent approximately one per cent of all sites expected to exist within the three-year flowline of the Bayou Cocodrie and Tributaries Project area.

If SCS-type drainage improvements are undertaken within the project area, an additional seven archeological sites can be expected to experience impacts. These sites could be located throughout the 100-year flowlines of the project area. Three sites will be located in Reach K. All are expected to represent late nineteenth to twentieth century secondary refuse disposal sites. Two sites are expected to occur within Reach L. Both are expected to represent late nineteenth to early twentieth century secondary refuse disposal sites with Middle to Late Woodland prehistoric components present as well. The other two sites will be located in Reach M. All will contain late nineteenth to early twentieth century historic materials. One of these sites may represent a habitation site. Either one of the sites, or both sites, may contain prehistoric materials. There is a high probability that any of these prehistoric occupations would represent Middle to Late Woodland resource extraction sites.

The potential for adverse impact to any of these sites as a result of the activities associated with SCS-type drainage improvements is high. The construction of channels and berms, the disposal of dredged and excavated materials, and subsequent clearing and agricultural utilization which will result can have serious effects on the integrity of archeological resources. With the exception of the latter activities, however, most of these effects will be localized. In fact, the most destructive activities, those associated with the construction of new channels, are expected to impact adversely only one site. Therefore, the potential for information loss at all sites is minimal.

The potential for adverse impacts on the regional archeological resource base for either source is minimal given the small percentage of site impacts expected to occur (i.e., approximately 3.7 per cent of all resources within the 100-year flowline from all sources of impact) and the nature of most impacts expected to occur as a result of project-induced land clearing or SCS-type drainage improvements. The only exception to this assessment concerns possible impacts to Marksville maintenance sites. These kinds of sites constitute an under-represented component of the prehistoric resource base, as evidenced by their low count among the sites utilized in the regional comparisons discussed in Chapter VII. Adverse impacts to this important component of the archeological resource base of the project area could result in the loss of significant information from the regional archeological resource base. While most impacts to this kind of site are expected to be disruptive rather than destructive (i.e., scattering artifacts or dislocating clusters of behaviorally related artifacts), the construction of new channels associated with SCS-type drainage improvements may result in the destruction of one Marksville maintenance site. Since these kinds of sites possess great potential for contributing to the understanding of an important period of the prehistoric past, the loss of a single site could be significant. Efforts to prevent such a loss should be undertaken. Some possible efforts to prevent this destruction are described in more detail in Chapter IX. It should be emphasized, however, that the destruction of a Marksville maintenance site is less likely than its disturbance by project-induced land clearance or less destructive activities associated with SCS-type drainage improvements. And, this loss would represent only one site, or 0.3 per cent of the entire archeological resource base within the 100-year flowline of the Bayou Cocodrie and Tributaries Project area.

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CHAPTER IX

CONCLUSIONS AND RECOMMENDATIONS

The conclusions of this study are presented as a brief summary of the results of the analyses of site distributions and land use within the Bayou Cocodrie and Tributaries Project area. The initial discussion will present the projected distributions of sites with respect to reach and geomorphic stratum. A statement concerning the ability of the survey results to address current research questions within the region will follow the project-specific discussion. The third section will summarize the predicted effects of changing land use on the archeological resource base of the project area. The presentation of recommendations concerning the sites located during this survey and additional research will conclude this chapter.

The Relationships of Archeological Sites to the Strata

Two sets of criteria have been employed to stratify the project area. The first set is the drainage reaches defined by the New Orleans District, U.S. Army Corps of Engineers. These drainages represent distinct physiographic portions of the greater drainage system and present different relationships to the surrounding watercourses and larger topographic features. These are Reach K, Reach L, and Reach M. The second set of criteria is based upon the presence of certain geomorphological features which create the surfaces upon which archeological sites can occur. Four types of features or deposits have been defined. These are: abandoned channels, abandoned courses, point bars, and backswamp. These features are distributed unevenly among the three drainage reaches which encompass the present study area. The second set of criteria have been employed to estimate site densities for each Reach since the survey is considered to provide a weak estimate of the actual population of sites within the Reach.

Distributions By Reach

The observed site densities within the surveyed portions of each reach have been employed to estimate site densities within the wooded portions of these reaches in the three-year flowline. Reach K is expected to contain the lowest density of archeological sites (0.014 sites per hectare or 0.006 sites per acre). A total of 51 sites are expected to occur within the wooded portions of Reach K in the three-year floodpool. Three of the estimated total number of sites in Reach K are expected to experience impacts as a result of project-induced land clearing.

Reach L is expected to contain the second highest density of archeological sites (0.03 sites per hectare or 0.01 sites per acre). A total of 18 sites are expected to occur within the wooded portions of Reach L in the three-year floodpool. Two of the estimated total number of sites in Reach L are expected to experience impacts as a result of project-induced land clearing.

Reach M is expected to contain the highest density of historic and prehistoric sites (0.03 sites per hectare or 0.014 sites per acre). A total of 21 sites are expected to occur within the wooded portions of Reach M in the three-year floodpool. One of the estimated total number of sites in Reach M is expected to experience impacts as a result of project-induced land clearing.

Distributions By Geomorphic Stratum

Four geomorphological strata have been defined within the project area. These strata are abandoned channels, abandoned courses, point bars, and backswamp. These strata are expected to display different attributes which have affected prehistoric utilization of the alluvial floodplain. A model of the nature of human activities expected to occur within each stratum has been employed to estimate site densities within each stratum. These expected densities are: abandoned courses will display the highest site densities; point bar deposits will display the next highest density of prehistoric sites; backswamp deposits will display site densities considerably less than the former two strata; and, abandoned channel deposits will display the lowest site densities. Observed site densities within these strata support these expected densities.

Twenty hectares (16 per cent) of the abandoned channel deposits have been examined. No archeological sites were discovered in this stratum. The estimated site density within abandoned channel deposits is 0.00 sites per hectare or acre. No prehistoric or historic sites can be expected to occur within this stratum over the entire project area.

Twelve hectares (16 per cent) of the abandoned course deposits have been examined. Four sites were discovered during the survey. These sites contain four prehistoric components. The estimated site density within the abandoned course stratum is 0.25 sites per hectare or 0.1 sites per acre. Nineteen total sites are expected to occur within the abandoned course stratum over the entire project area; six are expected to contain prehistoric components.

Fifty-four hectares (7.8 per cent) of the point bar deposits within the project area have been examined. One archeological site containing one prehistoric component was discovered. The estimated site density within this stratum is 0.02 sites per hectare or 0.008 sites per acre Fourteen sites, containing both historic and prehistoric components, are expected to occur within this stratum in the entire project area.

One hundred and forty-eight hectares (3.6 per cent) of backswamp deposits have been examined. Two sites containing two prehistoric components were discovered. The estimated site density within the backswamp stratum is 0.014 sites per hectare or 0.006 sites per acre. Fifty-seven sites are expected to occur within the backswamp over the entire project area; twenty-nine will contain prehistoric components.

Assessment of Site Distributions

The distributions of sites can be examined to assess their ability to address major themes of research defined for the region containing the project area. Recent prehistoric studies have focused on man-land relationships within the alluvial floodplain. These studies have attempted to develop models of site location or temporal association based on the nature or age of the features upon which sites are discovered. The use of four geomorphological strata within the project area and the development of a model of prehistoric utilization of these features has permitted the discussion of these man-land relationships in the present study. Four historic themes have been defined by Goodwin et al. (1986) to guide research within St. Landry Parish related to the historic occupation and utilization of the area. These are: the military occupation of the parish during the Civil War, ethnic diversity among the historic population of St. Landry Parish, changing settlement patterns reflecting changing agricultural practices following the Civil War, and the development of the shipping industry in the port of Washington, Louisiana.

Prehistoric Man-Land Relationships

The survey results permitted the estimation of site densities within each of the four geomorphological strata. These estimated densities were compared to the predicted relative densities derived through the general model of prehistoric utilization of the alluvial floodplain. The results of these comparisons suggest that the model provides an adequate representation of the number of activities expected to have occurred within these four strata.

The observed site densities within each stratum reflect the relative order developed through the model. Abandoned course deposits were expected to display the highest site densities. The observed density was 0.08 prehistoric sites per hectare (0.03 sites per acre). The point bar deposits were expected to display the next highest density. The observed density was 0.02 sites per hectare (0.008 sites per acre). Backswamp deposits were expected to contain low site densities. The observed density was 0.007 sites per hectare (0.003 sites per acre). The abandoned channel deposits were expected to display the lowest density of sites. The observed density of sites was 0.00 sites per hectare/acre (no sites were discovered).

With respect to temporal associations, most sites appear to be associated with relict features or drainages as opposed to active ones. All of the observed sites were associated with deposits from earlier fluvial episodes. Comparisons including all identifiable sites in or near the project area suggested the same association. Sixty-four per cent of these sites (n=25) were associated with relict features or drainages. This is especially true for Middle and Late Woodland and Mississippi period sites. If, however, the associations of prehistoric to relict drainages are examined in light of the reoccupation of older watercourses by later streams, the predilection for relict watercourses is less evident in Middle Woodland to Mississippi period sites. Approximately fifty per cent of the sites of each period (i.e., Marksville, Coles Creek, Plaquemines/Mississippi) are associated with relict drainages. More specific examinations of the setting of these sites would be necessary to clarify this ambiguous situation.

The comparability of the survey results and the predicted site densities derived from the general model of human utilization of the alluvial floodplain presented in Chapter II suggest that the hypothesized man-land relationships underlying this model and the stratification of the project area are valid. The model, however, does provide a weak estimate for some of the strata, particularly the abandoned channel deposits and possibly, the backswamp deposits. These weaknesses could be assessed by redefining the abandoned channel stratum and by increasing the sampling fraction within the backswamp stratum. Additional applications and refinements would be necessary to demonstrate its applicability throughout the alluvial bottomlands of the lower Mississippi Valley.

Historic Themes

All of the historic sites discovered during the survey represent late nineteenth or early twentieth century occupations. While earlier artifacts are present in some assemblages, their low frequencies suggest the continued use of older ceramic styles rather than longer spans of occupation. With the possible exception of the LeBlanc #2 site (16SL93), all appear to represent secondary refuse disposal sites. The LeBlanc #2 site may represent a habitation site, although no evidence of extant foundations or architectural features were observed at the site. These sites provide evidence for the dispersion of historic populations through areas that were used formerly as agricultural fields. These data provide evidence for changing land use and settlement patterns within St. Landry Parish and the surrounding region following the Civil War.

Effects of Land Use on Archeological Resources

The completion of the Bayou Cocodrie and Tributaries Project is expected to alter current land use patterns through the clearing of presently wooded areas for use as agricultural land. In addition, the reduced flooding in the project area which will result from the completion of the project will permit the implementation of SCS type drainage improvements. These improvements can be expected to permit additional clearance and conversion of wooded tracts to agricultural land.

Estimates of the amount of this clearance by the New Orleans District, U.S. Army Corps of Engineer have been employed to determine the extent to which the archeological resource base of the wooded portions of the project area will experience impact as a result of these projected activities. The location of these expected impacts and their effect on the archeological resources has been predicted as well.

An estimated 286 hectares of woodland (705 acres or six per cent) are expected to be cleared within the three-year flowline of Reaches K, L, and M as a result of the completion of the Bayou Cocodrie and Tributaries Project. Of this total, 188 hectares (465 acres) will be in Reach K, 68 hectares (165 acres) will be in Reach L, and the remaining 30 hectares (75 acres) will be in Reach M. These areas represent five, eleven, and five per cent of all woodlands within the three-year flowline in Reaches K, L, and M, respectively.

This amount of clearance is expected to impact a maximum of six sites in Reaches K, L, and M. These sites represent 6.7 per cent of all archeological resources within the wooded portions of the three-year flowline of the project. Three of these sites are expected to occur in Reach K. Two will occur in Reach L. The remaining site is expected to occur in Reach M.

All of the sites expected to experience impact in Reach K will represent historic occupations, given the nature of sites observed within the reach during the survey.

Both of the sites expected to experience impact in Reach L will be historic sites; both may contain prehistoric components also, given the nature of the only site observed within the reach during the survey. Prehistoric sites are expected to represent a resource extraction sites.

The site expected to experience impact in Reach M will represent an historic occupation. There is a probability of 0.6 for this site to contain a prehistoric component also. If present, the prehistoric site has a probability of 0.66 to represent a small, diffuse scatter of material related to the procurement of resources by prehistoric peoples and a probability of 0.33 to represent a site used as a residential base camp. A maintenance site is expected to contain evidence of diverse activities related to the processing and consumption of the resources collected from smaller resource extraction sites. A maintenance site is expected to contain higher densities of cultural materials and greater evidence of human occupation (e.g., features, middens, etc.) than resource extraction sites. There is a probability of 0.75 for all prehistoric sites to represent Middle to Late Woodland period occupations.

Of the six historic sites expected to experience impacts in Reaches K, L, and M, five will represent secondary refuse disposal sites. The other site may represent a habitation site. All sites are expected to represent late nineteenth to early twentieth century occupations.

Impacts to the prehistoric sites resulting from project-induced land clearance and initial agricultural activities are expected to be minimal. This assessment is based upon the nature of the information contained in most of the sites discovered in the surveyed portions of the project area and observations of current techniques of land clearance and cultivation. The majority of the prehistoric sites expected to exist and experience impacts will represent resource extraction sites. These sites are expected to provide primarily locational information (i.e., associations with topographic or physiographic features, ecological settings, etc.). The activities currently employed to clear and cultivate land do not affect the integrity of this kind of information. As stated above, the continual disturbance of these sites by agricultural activities may result in a reduction of the probability of discovery for these sites. That is, while the materials are present at or near their original point of deposition, they may have dropped below a critical threshold of visibility through the dispersal of materials or a reduction in artifact size. If the sites cannot be discovered, the information contained in them is lost even though it is still present at or near its original location.

These activities have not affected seriously the multi-component maintenance site (the Milburn site, 16SL94) discovered during the survey. To date, subsurface disturbance has not occurred at this location at a sufficient depth to impact the extensive buried cultural deposits located at this site. Continued exposure to agricultural activities will result in damage to this site. This will lower the integrity of the location and detract from the site's eligibility for nomination to the National Register of Historic Places.

Effects to the majority of the historic sites (i.e., secondary refuse disposal areas) predicted to experience impacts are not expected to be adverse. Field observations suggest that the initial clearing and limited cultivation of land containing such sites does not damage seriously a site's information content. Long-term effects of cultivation are expected to represent adverse impacts due to a decrease in the possibility of recognizing diagnostic materials (i.e., makers' marks, mold seams, etc.) which will result from the continued damage to shallowly buried or surface-occurring artifacts. Any habitation sites impacted (predicted n = 1) will suffer adverse effects as a result of land clearance and cultivation. Such impacts are expected to reduce the amount of functional information contained in these sites (i.e., the loss of architectural features or remains). These losses may limit the ability of analysts to determine the proper function of these sites (i.e., a locus of habitation).

Therefore, the initial clearing and cultivation of land employing techniques currently practiced within the project area is expected to impact 6.7 per cent of the extant archeological resource base. These impacts to the kinds of prehistoric sites and most of the historic sites predicted to exist within the project area (approximately 83 per cent of all sites which will suffer impact) will result in limited disturbance. This disturbance will not reduce significantly the integrity of these sites. Lengthy exposure (i.e., tens of years?) is expected to reduce the information content within these elements of the resource base by reducing their probability of discovery, damaging diagnostic materials sufficiently to prevent their identification, and/or disturbing the contextual relationships which may exist between buried materials.

The remaining seventeen per cent of the sites predicted to experience impacts (n = 1), representing historic habitation sites, are expected to suffer adverse effects from initial land clearance and cultivation. Contextual relationships provided by extant architectural features are expected to be lost through the conversion of woodland to cropland. The long-term effects of additional cultivation can be expected to further damage this site in a manner similar to that described above for the other kinds of sites predicted to exist within the project area.

An estimated 298 hectares (737 acres) of cleared and wooded land within the 100-year flowlines of the project area may be affected by SCS-type drainage improvements. While no such activities are planned at present, their implementation after the completion of the Bayou Cocodrie and Tributaries Project could result in additional impacts to the archeological resource base of the project area.

These activities are expected to affect a maximum of seven archeological sites. Three of these sites will occur in Reach K; two will occur in Reach L; and, the remaining two sites will be located in Reach M. All are expected to contain late nineteenth to early twentieth century historic materials. At least one of the sites may represent a habitation site. The others are expected to represent secondary refuse disposal areas. Approximately four of these sites may contain prehistoric components as well. Most are expected to represent Middle to Late Woodland resource extraction sites. At least one site may represent a maintenance locale.

The effects of impact to these sites which will result from most of the activities associated with SCS-type drainage improvements are similar to those expected as a result of project-induced land clearance. Therefore, minimal effects are predicted for most of the activities associated with SCS-type drainage improvements. The excavation of channels, however, may serve to destroy small refuse disposal areas or resource extraction loci which are predicted to represent the majority of the sites expected to experience impacts. Also, historic habitation or prehistoric maintenance sites could be seriously affected by channel construction. As stated in Chapter VIII, these adverse impacts are expected to affect only one site (0.3 per cent) within the entire population of sites (n= 352) predicted to represent the archeological resource base within the 100-year flowline of the Bayou Cocodrie and Tributaries Project area. While the loss of one site from a type which is represented frequently throughout the project area (e.g., resource extraction sites) is acceptable, if the damaged or destroyed site represents a more unique resource type (e.g., Marksville maintenance site), a more adverse effect would occur. Based on the results of this analysis, the probability of such adverse effects occurring as a result of SCS-type drainage improvements within the Bayou Cocodrie and Tributaries Project area is small. However, the uncertain scope and location of SCS-type improvements in the study area cause the estimates of site impacts to be less reliable than those for project-induced land clearing. For this reason, recommendations to overcome this weakness and to help prevent these possible effects are presented below.

Recommendations

Recommendations Concerning Project-Induced Land Clearing

Additional survey work within the three-year flowline of the project area is not recommended. This sample survey has provided an estimate of the archeological resource base within the project area. Evaluation of the results suggests that this estimate may be biased by a number of factors as discussed in Chapter VII. While these effects are considered to be minimal at present, additional samples would have to be drawn and additional analyses undertaken to assess their full impact to the five per cent sample discussed in this study. Some suggestions for improving the efficiency of future survey efforts are provided below in a subsequent section, if additional survey is considered necessary. The impacts as a result of project-induced land clearance are not considered significant given the nature of the resources and the impacts expected to occur.

Recommendations Concerning Subsequent Drainage Improvements

Most of the activities related to SCS-type drainage improvements will result in impacts similar to those described for project-induced land clearing. Additional archeological survey is not recommended for these portions of any SCS-type drainage improvements. However, the construction of new channels as part of SCS-type drainage improvements does possess a potential for significant adverse impact to the archeological resource base of the Bayou Cocodrie and Tributaries Project area. One site is expected to suffer impact as a result of channel construction activities. While most of the sites expected to experience impact as a result of these activities yield limited locational data, the possible loss of an historic habitation or Marksville maintenance site could remove a significant component from the settlement systems of past human occupants within the project area.

If SCS-type drainage improvements are planned in the future, efforts to prevent the loss of such important sites should be undertaken. These efforts should include an examination of the planned corridors of drainage works in order to predict whether archeological resources are likely to exist in the impact corridors. Gibson (1981) conducted a similar study of the planned Soil Conservation Service drainage improvements in Eastern Rapides and South Central Avoyelles Parishes. In that study, Gibson (1981) was able to predict the probability of archeological resources along the impact corridors based upon soil types, topography, and other environmental variables. From these probabilities, areas were designated for archeological reconnaissance or survey to determine whether archeological resources existed in these areas. If a similar study is undertaken prior to SCS-type drainage improvements in the Bayou Cocodrie and Tributaries Project area, similar data plus the landforms employed in this study should be utilized to define high probability areas. Historic maps of the region also should be be examined to determine whether any historic habitation sites are likely to exist within the impact corridors. Any portions of the impact corridors identified through such a study as possessing a high probability for containing historic habitation sites or prehistoric maintenance sites should be subjected to intensive survey prior to any construction activities. More intensive data recovery techniques may be necessary if significant archeological sites are discovered and the scope of the impacts endangers sensitive portions of these resources.

Site-Specific Recommendations

Seven sites were discovered during the survey of five per cent of the wooded lands within the three-year flowline of the Bayou Cocodrie and Tributaries Project. Six of these sites displayed no characteristics for consideration of eligibility for nomination to the National Register of Historic Places. These sites included: the Noel Slough site (16SL89), the Bayou Toulouse site (16SL90), the Bertrand site (16SL91), the LeBlanc #1 site (16SL92), the LeBlanc #2 site (16SL93), and the Mire site (16EV61). One site, the Milburn site (16SL94), was considered eligible for nomination to the National Register of Historic Places.

The Milburn site is a multi-component site associated with a small mound. The components include Marksville period (identified through ceramic types), Troyville, Coles Creek period (identified through ceramic types), and late nineteenth century historic (identified through ceramic and glass types). With respect to the prehistoric components, both are associated with buried subsurface deposits. These deposits occur between fifteen and forty-five centimeters below the ground surface. At least one possible hearth was encountered during shovel test examinations of the site. This site displays integrity of location, e.g., the site occupies its original location; and, remains there are predominantly in situ. The presence of intact subsurface deposits and features suggests that information related to the activities carried out on the site by its prehistoric occupants can be recovered. This information would permit additional verification of the known temporal span for the Coles Creek and Marksville phases, and assessments of the utilization of the alluvial floodplain during these prehistoric time periods.

Project-induced land clearing expected to result from the completion of the Bayou Cocodrie and Tributaries Project will cause no adverse effects to this site since it lies in a cleared agricultural field. Further investigations at this site, conducted under the auspices or directives of the U. S. Army Corps of Engineers in conjunction with the Bayou Cocodrie and Tributaries Project, are not recommended. The presence and location of the Milburn site (16SL94) should be noted, however, in the event that future activities, such as SCS-type drainage improvements, threaten this potentially significant resource. As a result of such threats, additional investigations should be undertaken by the agency or party responsible for the possible impacts. These investigations would permit the delineation of cultural stratigraphy, possible activity areas, and construction sequences for the "mound" feature. These investigations should include additional auger tests, limited excavations, and further controlled surface collection. Such investigations would permit a better assessment of the site's potential for providing information concerning the prehistory of the Atchafalaya Basin and the lower Mississippi Valley.

Future Survey and Analyses

Additional survey for the characterization of the archeological resource base of the project area is not recommended. However, verification of the stratification of the project area by geomorphological features and the model of human utilization of the alluvial floodplain underlying this stratification could be tested through additional archeological survey within the region. Future studies could help to clarify the effects of the factors which may have affected the results of this survey discussed in Chapter VII. Additional investigations would increase the site inventory for the project area permitting assessments of the observed distributions of sites resulting from this study.

If the geomorphological strata defined in this survey are employed to identify areas of high probability for impact to the archeological resource base as reflected through their estimated densities of archeological sites, additional research to identify relevant local attributes (e.g., specific soil types, relationships to relict or modern physiographic features) will be necessary to employ adequately the backswamp stratum. Such efforts may be possible with a minimum amount of field reconnaissance to verify the specific attributes selected as relevant. Refinement of the model employed in this study could help to fit it more to the actual relationships between the geomorphic features within the project area and past human behavior. This would help overcome some of the factors which may have affected the present study as discussed in Chapter VII.

Future researchers may wish to employ the minimum sample fractions defined through the results of this study to insure adequate survey coverage within similar geomorphological strata. In addition, different recovery techniques or analytical approaches may be more appropriate for discussions of human utilization of much of the alluvial floodplain. These techniques or approaches would include smaller shovel test intervals in abandoned channel or backswamp strata or nonsite analytical perspectives for determining the distribution of past human activities within the region. In concert with additional probabilistic examinations of portions of the lower Mississippi River Valley, the reconstruction of prehistoric settlement and subsistence patterns within the alluvial bottomlands of the region may be possible.

In sum, this study has provided an opportunity to examine man-land relationships in a portion of the lower Mississippi River alluvial valley. Combined with previous studies, the results described herein present a valid approach to the recovery of information concerning prehistoric human utilization of this major region of Louisiana.

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APPENDIX I

LMNPD-RA 30 December 1985

SCOPE OF SERVICES
CULTURAL RESOURCES SAMPLE SURVEY OF THE
BAYOU COCODRIE & TRIBUTARIES PROJECT
ST. LANDRY, EVANGELINE, AND AVOYELLES PARISHES, LOUISIANA
Contract DACW29-85-D-0113, Delivery Order 05

1. Introduction. This contract effort is intended to assist the U.S. Army Corps of Engineers, New Orleans District in preparation of an Environmental Impact Statement for the Bayou Cocodrie and Tributaries, Louisiana, project. Federal improvements would result in a significant increase in hydraulic capacity of Bayou Courtableau. Therefore, the potential for agricultural intensification would be created in the project area. This intensification would include project-induced land clearing (conversion of woodlands to cropland) and possibly "SCS Type" drainage laterals. The contract effort will consist of a stratified random sample survey designed to characterize the resource base and an analysis of land use in the study area to assess the impacts of the intensification on cultural resources.

The sample survey will supplement other cultural resources studies of the project including an intensive survey of the construction right-of-way along Bayou Courtableau, a remote sensing survey of Bayou Courtableau designed to identify submerged cultural resources, and the consultation process to address potential adverse effects on Washington, a National Register district. This effort will contribute to the data base for assessment of project effects on National Register and Register-eligible properties and consideration of possible mitigation measures. As such, the sample survey will provide the basis for compliance with Federal historic preservation laws.

Cultural resources which are expected to exist in the study area include prehistoric and historic archeological sites. The geomorphology of the study area is complex and some land surfaces are relatively ancient.

2. Background. The Bayou Cocodrie and Tributaries, Louisiana, project was authorized by Section 3 of the Flood Control Act of 18 August 1941, House Document No. 359, 77th Congress. The project purpose is to control floods in the lowland portions of the watersheds of Bayous Rapides, Boeuf, and Cocodrie, by the improvement and realignment of existing channels, construction of diversion canals, and the installation of control structures. Project construction was initiated in June 1946, and the project is now 53% compete (see Attachment 1). Because Bayou Courtableau had inadequate capacity to carry the outflow of the project, a diversion channel from Washington, Louisiana, to the West Atchafalaya Basin Protection Levee borrow pit to augment Bayou Courtableau was authorized in 1965, House Document No. 308, 85th Congress. Subsequent to this authorization, the St. Landry Parish Police Jury requested that Bayou

Courtableau be enlarged in lieu of constructing the diversion channel because rights-of-way required to construct the diversion channel were not acquirable. Section 87 of the Water Resources Development Act of 1974 modified the project to provide for the enlargement of Bayou Courtableau from Washington, Louisiana, to the WABPL and for construction of additional culverts through the WABPL as necessary. The New Orleans District is preparing a General Design Memorandum (GDM) and Environmental Impact Statement (EIS) to describe the impacts of the enlargement of Bayou Courtableau from the vicinity of Washington to the vicinity of Courtableau, Louisiana.

3. General Nature of the Work. The work to be performed by the Contractor shall be a stratified random sample survey of the affected drainage reaches and an analysis of land use in the project areas. The sample survey effort will begin with stratification of the affected areas and design of a sampling approach to provide adequate coverage of the drainage reaches. The result of the sample survey will be the characterization of the resource universe. The second task is the analysis of land use. Recent agricultural patterns will be studied to predict project-induced impact areas. Thus, the sample survey will characterize the resource base in the affected areas and the land use analysis will specify those areas most likely to be impacted as a result of the project. From this information, the Contractor shall estimate the impacts of the project-induced intensification on the cultural resource base.

The potential significance of the affected resources will be evaluated within the framework of the approved research design for the Bayou Courtableau area developed by Goodwin and Associates under Contract DACW29-84-D-0029, Delivery Order 09.

4. Description of the Study Area. The study area generally consists of Reaches K, L, and M of the Bayou Cocodrie and Tributaries project. The study, however, shall focus on the wooded areas within the 3-year without project overflow lines. The study area is shown on the attached map (Attachment 1) and described below:

Reach	Total Area	Area Within 3-Year Flowline	1984 Wooded Area Within 3-year flowline & % of Total Area	Estimate of Project-Induced Clearing & % of Wooded Area
K	37,500	17,400	9,300 (53%)	465 (5%)
L	35,100	5,700	600 (10.5%)	165 (28%)
M	14,400	3,700	1,500 (41%)	75 (5%)
Totals:	87,000 acres	26,800 acres	11,400 acres (43%)	705 acres (6%)

Project-induced land clearing would occur in the presently wooded areas (11,400 acres) within the 3-year without-project overflow lines. Estimates, by reach, of the acreage which would be converted to cropland as a result of the project are provided above. A total of 705 acres (or 6% of presently wooded areas) of project-induced land is estimated.

At present, no SCS type watershed plans are imminent in the Bayou Cocodrie project area. However, the potential for maximum intensification of agricultural endeavors would be realized in the project area if associated major and on-farm drainage laterals were excavated, and on-farm land treatment measures were implemented. Maximized potential benefits were computed for the adjacent Eastern Rapides and South-Central Avoyelles Parishes basin which incudes the associated SCS Chatlin Lake and Avoyelles-St. Landry Watershed work plans. With the Bayou Courtableau excavation completed, the economic incentive would be provided for comparable drainage laterals and land treatment measures. Although the exact extent of project construction, effects, and agencies to do the work are unknown, construction amounts and effects have been projected (based upon the Eastern Rapides project):

PROJECTION OF BAYOU COCODRIE ASSOCIATED CONSTRUCTION IMPACTS

		ERSCAP	Bayou Cocodrie
Basis:	Open land acres benefitted	139,500	45,550
Affected:	Miles existing channel to be worked	250	82
	Miles new land cuts	15	5
Gains:	New channel acres	250	82
	Disposal acres	277	90
	Wooded berm acres	95	31
Losses:	Wooded acres	1,104	360
	Open land acres	1,155	377

Maps illustrating the two SCS watershed work plans for the Eastern Rapides and South Central Avoyelles project area are attached (Attachment 2).

5. Study Requirements. The evaluation will be conducted utilizing current professional standards and guidelines including, but not limited to:

- the National Park Service's draft standards entitled, "How to Apply the National Register Criteria for Evaluation," dated June 1, 1982;
- the Secretary of the Interior's Standards and Guidelines for Archeology and Historic Preservation as published in the Federal Register on September 29, 1983;
- Louisiana's Comprehensive Archeological Plan dated October 1, 1983; and

- o The Advisory Council on Historic Preservation's regulations 36 CFR Part 800 entitled, "Protection of Historic and Cultural Properties."

The work will be divided into three phases: Development of the Sampling Methodology, Sample Survey, and Data Analysis and Report Preparation.

a. Phase 1: Development of the Sampling Methodology. The Contractor shall commence with the development of the methodology for the sample survey. This effort shall proceed generally as follows:

(1) The Contractor shall review the approved research design for the Bayou Courtableau area produced under Contract No. DACW29-84-D-0029, Delivery Order 09, available historic maps, the geomorphology of the study area, previous surveys in the study areas, recorded sites, etc. to provide a baseline of current knowledge of the cultural resources base. Limited historical research will be conducted to determine the historic setting of the study areas. Detailed, chain of title type research is not necessary.

(2) The next step is for the Contractor to stratify the study area based on geomorphology, soil types, and other relevant data.

(3) The Contractor shall then design the random sampling methodology focusing the fieldwork on the presently wooded areas (11,400 acres) within the 3-year without-project overflow lines. Transect survey methodology oriented to cut across the identified strata is recommended. A 5 percent sample size (approximately 600 acres) will be employed.

(4) The Contractor shall submit two copies of a report documenting the sample survey methodology to the Contracting Officer's Representative within 4 weeks after award of the delivery order for review and approval. The methodology will be reviewed by the technical representative and all comments will be resolved or incorporated within 2 weeks after submittal.

b. Phase 2: Sample Survey. Upon approval of the Phase 1 report by the Technical Representative, the Contractor shall initiate the fieldwork. The survey shall be a pedestrian investigation augmented with systematic subsurface testing. Survey transect width will be 20 meters with shovel testing every 100m along the transects. State site forms will be completed and state-assigned site numbers will be utilized for all archeological sites located by the survey. All sites located in the survey corridors will be sketch-mapped, photographed, and briefly tested using shovel, auger, and limited controlled surface collection to determine depth of deposit, site boundaries, stratigraphy, cultural association, and possible activity areas. Any pre-World War II standing structures located in the survey transects will be recorded using a minimum of three clear black and white photographs. For structures located in the survey transects, the contractor shall also address the archeological component of the site.

c. Phase 3: Data Analyses and Report Preparation. The sampling survey data, the geomorphology of the area, and other cultural resources data for the area will be analyzed to predict the nature of the cultural resource universe in Reaches K, L, and M. The sampling survey data will be used to predict the site density in the study area by identified strata. The further characterization of the resource base (i.e. types of sites, cultural periods represented, etc.) will be accomplished with knowledge of the geomorphological development of the study area, known sites in the study area, and sites located by the sample survey. The resource base will be characterized and described as to:

(1) type, range, and quantities of resources expected to exist;

(2) probability analysis of site location by culture period and type of site;

(3) sensitivity analysis of the stratified study area;

(4) assessments of relative significance of resources expected to exist based on site integrity, regional data gaps and research problems, quantity of site types, and expected data yield by period and types of sites.

The above requirements are considered minimal, not exhaustive.

Upon completion of this analysis, the Contractor shall perform a land use analysis. Recent agricultural patterns and comparable SCS plans from the Eastern Rapides project will be reviewed to predict project-induced impact areas. Project-induced impacts include land clearing, and SCS-type lateral drainage improvements and land improvements. All land clearing will take place within the 3-year floodplain while the SCS-type improvements will affect the entire drainage reaches. An economic study performed by Gulf South Research Development Corporation for the Bayou Cocodrie project, similar SCS watershed plans in the Eastern Rapides project areas, and infrared imagery from 1978 and 1983 will provide the bases for this analysis.

Upon completion of these analyses, the Contractor shall estimate the project-induced effects on the cultural resources base in Reaches K, L, and M of the project. The assessment will quantify and specify the impacts (i.e., numbers, types, cultural associations) to the maximum extent possible. The Contractor shall also assess the significance of the project-induced impacts on the overall resource base.

The analyses will be fully documented. Methodologies and assumptions employed will be explained and justified. Inferential statements and conclusions will be supported by statistics where possible. Specific requirements for the draft report are contained in Section 6 of this Scope of Services.

6. Reports:

a. Phase 1, Sampling Methodology. Two copies of the report on the results of the Phase 1 investigations will be submitted to the COR within 4 weeks after work item award for review and approval. This report will summarize the results of the literature review and records search, and will present in detail the proposed sampling methodology.

b. Draft and Final Reports (Phases 1, 2, & 3). Six copies of the draft report integrating all phases of this investigation will be submitted to the COR for review and comment within 14 weeks after work item award. The written report shall follow the format set forth in MIL-STD-847A with the following exceptions:

(1) Separate, soft, durable, wrap-around covers will be used instead of self covers;

(2) page size shall be 8-1/2 x 11 inches with a 1-1/2 inch binding margin and 1-inch margins; and

(3) the reference format of American Antiquity will be used. Spelling shall be in accordance with the U.S. Government Printing Office Style Manual, dated January 1973.

The COR will provide all review comments to the Contractor within 6 weeks after receipt of the draft reports (20 weeks after work item award). Upon receipt of the review comments on the draft report, the Contractor shall incorporate or resolve all comments and submit one preliminary copy of the final report to the COR within 2 weeks (22 weeks after work item award). Upon approval of the preliminary final report by the COR, the Contractor will submit one reproducible master copy and 40 copies of the final report to the COR within 24 weeks after work item award. Included as an appendix to the Final Report will be a complete and accurate listing of cultural material and associated documentation recovered and/or generated which the Principal Investigator considers worthy of preservation. In order to preclude vandalism, the draft and final report shall not contain specific locations of archeological sites. Site specific information, including one set of quadrangle maps accurately delineating site locations, site forms, black and white photographs and maps, shall be included in an appendix separate from the Main Report. The Contractor shall submit six copies of this separate appendix with the draft reports, and one reproducible master copy and 30 copies with the Final Report.

7. Pertinent Data Available to the Contractor. The following will be provided to the Contractor by the Technical Representative:

a. Attachment 1: Map of Study Areas showing flowlines and wooded areas cleared from date of quads to 1984

b. Attachment 2: SCS Watershed Plans in Eastern Rapides Project Area

c. Economic study prepared in August 1984 by Gulf South Research Development Corporation entitled "Bayou Cocodrie and Tributaries, Louisiana."

d. Geologic quadrangle maps entitled "Distribution of Alluvial Deposits" for Bunkie, LA, Turkey Creek, LA, Opelousas, LA, and Palmetto, LA

e. 1 set of U.S.G.S. 15-minute and 7.5 minute series quadrangle maps of the study areas.

Aerial infrared imagery of the study area from 1978 and 1983 are available for review at the New Orleans District office.

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APPENDIX II

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TABLE OF TRANSECTS

Reach K

Transect	Quadrat	Stratum	UTM Origin Orientation	Description
43	314	abandoned channel	$^{33}95^{000}N$, $^{5}85^{680}E$ 180°	wooded
44	323	abandoned channel	$^{33}94^{500}N$, $^{5}85^{680}E$ 180°	wooded
45	332	abandoned channel	$^{33}94^{000}N$, $^{5}85^{680}E$ 180°	wooded
46	331	abandoned channel	$^{33}93^{500}N$, $^{5}85^{490}E$ 0°	wooded
47	322	abandoned channel	$^{33}94^{000}N$, $^{5}84^{980}E$ 0°	wooded
48	306	abandoned channel	$^{33}95^{000}N$, $^{5}85^{980}E$ 90°	wooded
49	307	abandoned channel	$^{33}95^{450}N$, $^{5}86^{000}E$ 90°	wooded
50	300	abandoned channel	$^{33}95^{500}N$, $^{5}86^{400}E$ 0°	wooded
51	294	abandoned channel	$^{33}96^{000}N$, $^{5}86^{410}E$ 0°/180°	95% pasture
52	295	abandoned channel	$^{33}96^{110}N$, $^{5}85^{500}E$ 45°/255°	wooded

53	25	backswamp	$^{34}{}_{10}{}^{080}{}_{N}$, $^{5}{}_{74}{}^{490}{}_{E}$ 45°	soy bean field
54	34	backswamp	$^{34}{}_{09}{}^{500}{}_{N}$, $^{5}{}_{74}{}^{950}{}_{E}$ 0°	wooded
55	70	backswamp	$^{34}{}_{06}{}^{960}{}_{N}$, $^{5}{}_{76}{}^{500}{}_{E}$ 270°	wooded
56	103	backswamp	$^{34}{}_{04}{}^{550}{}_{N}$, $^{5}{}_{77}{}^{000}{}_{E}$ 270°	wooded
57	159	backswamp	$^{34}{}_{03}{}^{000}{}_{N}$, $^{5}{}_{83}{}^{460}{}_{E}$ 225°	wooded
58	248	backswamp	$^{33}{}_{99}{}^{230}{}_{N}$, $^{5}{}_{85}{}^{280}{}_{E}$ 0°	open field
59	207	backswamp	$^{34}{}_{00}{}^{810}{}_{N}$, $^{5}{}_{84}{}^{800}{}_{E}$ 90°	wooded
60	208	backswamp	$^{34}{}_{01}{}^{880}{}_{N}$, $^{5}{}_{85}{}^{200}{}_{E}$ 270°	wooded
61	255	backswamp	$^{33}{}_{98}{}^{500}{}_{N}$, $^{5}{}_{82}{}^{330}{}_{E}$ 0°	wooded
62	33	backswamp	$^{34}{}_{10}{}^{000}{}_{N}$, $^{5}{}_{74}{}^{050}{}_{E}$ 340°	wooded
63	40	backswamp	$^{34}{}_{09}{}^{500}{}_{N}$, $^{5}{}_{74}{}^{270}{}_{E}$ 340°	wooded
64	69	backswamp	$^{34}{}_{06}{}^{780}{}_{N}$, $^{5}{}_{75}{}^{840}{}_{E}$ 320°	wooded
65	166	backswamp	$^{34}{}_{02}{}^{000}{}_{N}$, $^{5}{}_{80}{}^{820}{}_{E}$ 321°	wooded
66	178	backswamp	$^{34}{}_{01}{}^{500}{}_{N}$, $^{5}{}_{81}{}^{500}{}_{E}$ 321°	wooded

67	243	backswamp	$^{33}{}_{99}{}^{320}{}_{N}$, $^{5}{}_{82}{}^{500}{}_{E}$ 90^{o}	wooded
68	241	backswamp	$^{33}{}_{99}{}^{320}{}_{N}$, $^{5}{}_{82}{}^{000}{}_{E}$ 270^{o}	cultivated field
69	114	backswamp	$^{34}{}_{04}{}^{000}{}_{N}$, $^{5}{}_{77}{}^{020}{}_{E}$ 135^{o}	fallow rice field
70	64	backswamp	$^{34}{}_{07}{}^{170}{}_{N}$, $^{5}{}_{76}{}^{880}{}_{E}$ 270^{o}	corn field
71	222	backswamp	$^{34}{}_{00}{}^{500}{}_{N}$, $^{5}{}_{85}{}^{250}{}_{E}$ 180^{o}	90% soy bean 10% wooded
75	354	backswamp	$^{33}{}_{92}{}^{500}{}_{N}$, $^{5}{}_{88}{}^{950}{}_{E}$ 0^{o}	wooded
76	355	backswamp	$^{33}{}_{92}{}^{000}{}_{N}$, $^{5}{}_{89}{}^{040}{}_{E}$ 180^{o}	wooded

Reach L

Transect	Quadrat	Stratum	UTM Origin/ Orientation	Description
1	21	point bar	$^{33}85^{720}N$, $^{6}06^{000}E$ $0^{o}/180^{o}$	wooded
2	34	point bar	$^{33}84^{300}N$, $^{6}06^{200}E$ $0^{o}/180^{o}$	cleared
3	46	point bar	$^{33}83^{900}N$, $^{6}06^{000}E$ 270^{o}	50% wooded
4	33	point bar	$^{33}84^{000}N$, $^{6}05^{840}E$ 0^{o}	50% wooded
5	27	point bar	$^{33}84^{500}N$, $^{6}02^{200}E$ 180^{o}	wooded
6	39	point bar	$^{33}84^{000}N$, $^{6}02^{200}E$ $180^{o}/0^{o}$	wooded
7	2	point bar	$^{33}85^{500}N$, $^{6}02^{890}E$ $180^{o}/0^{o}$	soy bean field
8	2	abandoned course	$^{33}85^{740}N$, $^{6}02^{890}E$ $180^{o}/0^{o}$	soy bean field
9	9	abandoned course	$^{33}85^{270}N$, $^{6}03^{000}E$ $90^{o}/270^{o}$	soy bean field
10	10	point bar	$^{33}85^{380}N$, $^{6}04^{000}E$ $270^{o}/90^{o}$	wooded

11	78	abandoned course	$^{33}82^{500}N$, $^{6}06^{500}E$ 270^{o}	cleared
18	42	point bar	$^{33}84^{000}N$, $^{6}03^{940}E$	disturbed/
73	109	backswamp	$^{33}81^{000}N$, $^{6}06^{020}E$ 0^{o}	wooded
74	95	backswamp	$^{33}81^{500}N$, $^{6}05^{930}E$ 0^{o}	soy bean field
77	133	backswamp	$^{33}80^{440}N$, $^{6}05^{530}E$	wooded
78	132	backswamp	$^{33}80^{000}N$, $^{6}05^{320}E$ 0^{o}	soy bean field
79	112	backswamp	$^{33}81^{000}N$, $^{6}07^{900}E$	wooded/
80	113	backswamp	$^{33}81^{500}N$, $^{6}08^{000}E$	wooded/
81	125	backswamp	$^{33}81^{000}N$, $^{6}07^{500}E$	wooded/
82	18	abandoned course	$^{33}85^{500}N$, $^{6}03^{000}E$	wooded/

Reach M

Transect	Quadrat	Stratum	UTM Origin/ Orientation	Description
12	63	point bar	$^{33}{}_{82}{}^{500}{}_{N}$, $^{5}{}_{97}{}^{760}{}_{E}$ 180°	wooded
13	71	point bar	$^{33}{}_{81}{}^{500}{}_{N}$, $^{5}{}_{97}{}^{760}{}_{E}$ 180°	wooded
14	70	point bar	$^{33}{}_{81}{}^{000}{}_{N}$, $^{5}{}_{97}{}^{840}{}_{E}$ 0°	wooded
15	62	point bar	$^{33}{}_{81}{}^{500}{}_{N}$, $^{5}{}_{97}{}^{790}{}_{E}$ 0°	wooded
16	68	point bar	$^{33}{}_{81}{}^{380}{}_{N}$, $^{5}{}_{96}{}^{000}{}_{E}$ 350°	corn field
17	50	point bar	$^{33}{}_{82}{}^{000}{}_{N}$, $^{5}{}_{95}{}^{280}{}_{E}$ 180°	corn field
19	10	backswamp	$^{33}{}_{85}{}^{500}{}_{N}$, $^{5}{}_{94}{}^{040}{}_{E}$ $0^{\circ}/180^{\circ}$	wooded
20	9	backswamp	$^{33}{}_{85}{}^{060}{}_{N}$, $^{5}{}_{94}{}^{000}{}_{E}$ 270°	wooded
21	13	backswamp	$^{33}{}_{85}{}^{500}{}_{N}$, $^{5}{}_{93}{}^{560}{}_{E}$ 180°	wooded
22	21	backswamp	$^{33}{}_{85}{}^{000}{}_{N}$, $^{5}{}_{95}{}^{440}{}_{E}$ 180°	wooded
23	26	backswamp	$^{33}{}_{84}{}^{500}{}_{N}$, $^{5}{}_{95}{}^{460}{}_{E}$ 180°	wooded
24	27	backswamp	$^{33}{}_{84}{}^{000}{}_{N}$, $^{5}{}_{95}{}^{560}{}_{E}$ 0°	wooded

25	22	backswamp	$^{33}{}_{84}{}^{500}{}_{N}$, $^{5}{}_{95}{}^{550}{}_{E}$ 0^{o}	wooded
26	30	backswamp	$^{33}{}_{83}{}^{320}{}_{N}$, $^{5}{}_{94}{}^{600}{}_{E}$ $0^{o}/90^{o}$	wooded
27	31	backswamp	$^{33}{}_{83}{}^{750}{}_{N}$, $^{5}{}_{95}{}^{000}{}_{E}$ 90^{o}	wooded
28	54	point bar	$^{33}{}_{82}{}^{000}{}_{N}$, $^{5}{}_{97}{}^{390}{}_{E}$ 0^{o}	wooded
29	46	point bar	$^{33}{}_{82}{}^{500}{}_{N}$, $^{5}{}_{97}{}^{400}{}_{E}$ 0^{o}	wooded
30	76	point bar	$^{33}{}_{80}{}^{850}{}_{N}$, $^{5}{}_{97}{}^{000}{}_{E}$ 270^{o}	wooded
31	75	point bar	$^{33}{}_{80}{}^{840}{}_{N}$, $^{5}{}_{96}{}^{500}{}_{E}$ 270^{o}	wooded
32	69	point bar	$^{33}{}_{81}{}^{000}{}_{N}$, $^{5}{}_{96}{}^{900}{}_{E}$ 0^{o}	wooded
33	61	point bar	$^{33}{}_{81}{}^{500}{}_{N}$, $^{5}{}_{96}{}^{900}{}_{E}$ 0^{o}	wooded/ plowed field
34	67	point bar	$^{33}{}_{81}{}^{240}{}_{N}$, $^{5}{}_{95}{}^{760}{}_{E}$ 40^{o}	plowed field
35	42	point bar	$^{33}{}_{82}{}^{500}{}_{N}$, $^{5}{}_{95}{}^{260}{}_{E}$ 0^{o}	90% wooded
36	44	point bar	$^{33}{}_{82}{}^{820}{}_{N}$, $^{5}{}_{96}{}^{000}{}_{E}$ 90^{o}	wooded
37	37	abandoned course	$^{33}{}_{83}{}^{500}{}_{N}$, $^{5}{}_{95}{}^{940}{}_{E}$ 90^{o}	wooded
38	37	point bar	$^{33}{}_{83}{}^{450}{}_{N}$, $^{5}{}_{95}{}^{280}{}_{E}$ $180^{o}/0^{o}$	wooded

39	33	abandoned course	$^{33}{}_{83}{}^{500}{}_{N}$, $^{5}{}_{96}{}^{070}{}_{E}$ $0^{\circ}/180^{\circ}$	wooded
40	32	abandoned course	$^{33}{}_{83}{}^{540}{}_{N}$, $^{5}{}_{96}{}^{000}{}_{E}$ 270°	plowed field
41	38	point bar	$^{33}{}_{83}{}^{000}{}_{N}$, $^{5}{}_{96}{}^{300}{}_{E}$ 0°	wooded
42	33	point bar	$^{33}{}_{83}{}^{500}{}_{N}$, $^{5}{}_{96}{}^{290}{}_{E}$ $0^{\circ}/180^{\circ}$	wooded
72	51	point bar	$^{33}{}_{82}{}^{500}{}_{N}$, $^{5}{}_{95}{}^{740}{}_{E}$ 0°	weeds

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